Making home to be a better place

Enhancing home improvement activity through user experience design

Master thesis

Industrial and Stratgic Design, 2014

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Abstract

This thesis work is a collaboration project with a German power tool manufacturer. The main objective of this thesis work is to explore user experiences and emotional demands within a Do-It-Yourself home improvement and renovation context. Based on the findings of the research and analysis, a mobile app design concept will be created. This research finds that Do-It-Yourself home improvement and renovation works contain very complex details and processes behind the simple outlook. Non-professional people usually feel confused due to a lack of practical knowledge and experience to accomplish their goals. Through utilizing a self-created theoretical analysis toolkit, the key user experiences and emotional demands were defined. Furthermore, the design personas and value propositions connect the theoretical analysis and design ideation. Lastly, according to the research and analysis conclusions, a high fidelity interface design of the mobile app was created to represent the research results of the thesis study.

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Abbreviations

AmI: Ambient intelligence

App: Application

AXE: Anticipated experience Evaluation

IA: Information Architecture

Mobile app: Mobile application

HCD: Human-Centered Design

HCI: Human-Computer Interaction

Hi-Fi: High Fidelity

Lo-Fi: Low Fidelity

UI: User Interface

UXD: User Experience Design

UX: User Experience

Acknowledgements

This thesis project offers me a great opportunity to explore the household topic, the domain that I have been interested in for a long time. As a designer, working on my master thesis in the context of a company collaboration allowed me to understand that combining academic knowledge and business is not easy work.

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1 Introduction

The longer I live, the more beautiful life becomes. If you foolishly ignore beauty, you will soon find yourself without it. Your life will be impoverished. But if you invest in beauty, it will remain with you all the days of your life.

- Frank Lloyd Wright, American architect

The purpose of this chapter is to give a general introduction of the thesis work. Within this chapter, motivation and background of the thesis work will be introduced. Moreover, three major objectives and research questions will be mentioned.

1.1 Project Background

Home could be the most important and meaningful place in our entire lives. All of us need a trustworthy space to build up our lives and rest the body and soul. Therefore, the various dictionary definitions of “home” can provide some clues to this human demand, e.g., “it’s one’s place of residence,” “the social unit formed by a family living together,” “a familiar or usual setting: congenial environment,” “the focus of one’s domestic attention” (Merriam-Webster, 2014). These descriptions indicate human needs in several contexts, which motivate people to improve their home environments until they reach ideal conditions. However, these needs and motivations are modified through the change of time and life events. The hierarchy of needs theory could provide some clues into clarifying the phenomenon (Marslow, 1943).

In ancient times, the place we called home could be a rock cave or a rough log house, which is simply made of rough natural materials. It protects us from dangers in the wil. In other words, a home just has to satisfy our physiological and safety needs, such as being a shelter for rest, or a stable place that people can live and store private properties. As time went by, in contemporary society, our requirements for home do not stay at a low level of needs anymore, but has moved to higher levels. Love, affection, and a sense of belonging have emerged. For instance, the home is now a safe and comfortable place in which family members could live together, and share love and care for each other. Hence, people content with the three needs mentioned above realize that improving the aesthetics and functionality to their house could raise the quality of life and enhance another higher levels of needs: self-esteem and self-actualization. For example, decorating and choosing a good quality of materials for the house could be a chance for people to demonstrate their uniqueness, and earn respect and attention from others. Thus, home improvement activities would help people to achieve these higher levels of needs and mental satisfaction (Baum S. and Hassan R.,1999).

As mentioned above, improving the home environment should be a positive movement in which people enhance the needs of their dwelling (Baum S. and Hassan R.,1999). However, most people cannot enjoy the progress due to a jumble of problems that happen in the different stages of the process, especially if they proceed with the renovation by themselves. Through reviewing blogs in which people recorded their process of self home improvement, such as painting walls, assembling cabinets and adding wooden decks , they usually face collecting massive volumes of information from different sources, lacking knowledge of the practical working process and not knowing how to arranging time schedules efficiently. These events cause people to feel negative emotions, such as being lost, confusion, anxiety and depression. This phenomenon could significantly affect people’s actions and motivations to work on home improvement projects. (Barnes V.E., 2013, Mears T. 2014).

Through today’s rapid technological developments, people start to utilize various kinds of interactive products, such as mobile applications (hereafter referred to as mobile apps) to solve problems and proceed with home improvement activities efficiently. Nowadays, searching for renovation information on the Internet is common and convenient for most people. On the other hand, there are more functions that mobile devices could provide that do not simply focus on searching for information. According to the type and level of tasks, people use distinct and suitable apps to accomplish different tasks. However, the more choices we have, the more knowledge about operations we would need. Thus, to reduce the complexity and frustration of using apps during home improvement activities, the aim of this thesis work is to provide a simple and clear framework to structure projects and the mobility of assistance in order to guide people who get lost in the midst of improvement activities.

In addition, user experience design (hereafter referred to as UXD) could be seen as a major method that provides potential solutions and frameworks that reduce the frustration of managing complicated tasks and fulfilling positive psychological needs, as well as balance between positive and negative emotions. Hassenzahl mentioned (Hassenzahl, 2010) that experience emerges from the intertwined works of perception, action, motivation, emotion and cognition in dialogue with the world (place, time, people and objects). On the other hand, user experience (hereafter referred to as UX) is not much different from experience per se. It simply focuses on our interest in interactive products as the creators, facilitators and mediators of experiences. However, experience is subjective and we cannot create experiences by producing objective interactive products as experience contains interrelationships in the world and the influences that interactive products bring to user experiences. Furthermore, interactive products could shape users' feelings and thoughts and affect our experiences through their features (Hassenzahl, 2010).

Figure 1-1
Painting is one of the most common home improvement activity.

1.2 Collaboration with a German Manufacturer

This master thesis work is a collaboration with a German power tool manufacturer that is globally well known because of their frontier engineering designs. As a global enterprise which owns thousands of employees, the enterprise is not only famous for its exquisite engineering technology, but also its energetic innovative and futuristic scope. Besides being a major business in the automotive field, household technology is another of its business domains, which is well known internationally due to its excellent innovation and durable mechanical products.

My work experience in the collaboration company has mainly inspired this thesis work. I worked as an UXD intern between 2013 and 2014, and had opportunities to participate in intriguing projects. By participating and observing while working on projects, I found that household technology could be an interesting field in which to carry out personal studies and master thesis work.

As mentioned above, the collaboration company has strong market advantages in the household technology business, and power tools for non-professionals are the major products. I am highly interested in household related subjects because of its strong relationship to UX studies, and I could apply my academic knowledge of UxD and IxD to a practical project. Results of the thesis work could be beneficial for the collaboration company for future developments in household technology projects and other potential domains. However, this thesis work will mainly focus on UX research and human-computer interaction in home improvement activities and renovations, not the entire home technology field.

1.3 Objective

Home improvement is a complicated subject that involves discussions from many perspectives, such as UX, HCI, product design, usability engineering, psychology and strategic design. All these domains have their own distinct research approaches and variety of methods, but some of them are beneficial to the research and analysis work of the thesis. Thus, referring to theories from previous relevant works in efficient and reasonable ways as well as narrowing down the focus of home improvement are the most challenging points. I defined the following objectives based on user interviews and literature reviews. In addition, these objectives introduce different perspectives from Bosch's standard analyzing process. The company could benefit from carrying out these objectives. Based on the objectives of this thesis project, several research questions were conducted, and will be answered throughout the thesis work. The three major objectives of the thesis work are as follows:

- Building up theoretical frameworks for the thesis work through reviewing relevant works in qualitative research, interaction design and UXD studies
- Structure design processes based on theoretical frameworks
- Establishing the concept of the mobile app, which demonstrates mobility of assistance while users work on home improvement activities and influences of UX pattern studies

1. Build up theoretical frameworks for the thesis work through reviewing relevant works in qualitative research, HCI, product design and UXD studies:

As mentioned in the previous sections, household relevant subjects involve many different perspectives of study. There is no general theory framework that can apply to all subjects and discussions in this domain. Therefore, while this thesis work discusses the insights of home improvement activities, some theoretical frameworks should be established for specific topic research. To achieve the objective, similarities and common experiences from different users who have distinguishing working processes and assistances should be found. Grounded theory is the foundation method of this objective and used to analyze user insights. On top of grounded theory, UX patterns and pleasurable product research are utilized as major methods to achieve this objective. According to the study results of this objective, these frameworks can be utilized for design analysis.

2. Structure design processes and content based on the theoretical frameworks of the thesis work:

Designing for complex contexts, such as home improvement projects, requires a structured process to organize pieces of information and ideas for the developing of further concepts. Based on the theoretical frameworks that were established in the previous objective, the top findings will be extracted from the UX patterns and pleasurable product analysis. Through reviewing the top findings of research results, the design principles and opportunities of product development were defined. Moreover, through benchmarking with existing interactive products, analysis and principles of usability were generated.

3. Creating the concept of visualization of the mobile app, which can demonstrate the influences of UX pattern studies, as well as the mobility of assistance while users work on home improvement activities:

As mentioned in the previous sections, household relevant subjects involve many different perspectives of study. There is no general theory framework that can apply to all subjects and discussions in this domain. Therefore, while this thesis work discusses the insights of home improvement activities, some theoretical frameworks should be established for specific topic research. To achieve the objective, similarities and common experiences from different users who have distinguishing working processes and assistances should be found. Grounded theory is the foundation method of this objective and used to analyze user insights. On top of grounded theory, UX patterns and pleasurable product research are utilized as major methods to achieve this objective. According to the study results of this objective, these frameworks can be utilized for design analysis.

1.4 Thesis Structure

Chapter One and Two mainly describe the overview of the thesis work, relevant studies and definition of home improvement. Besides these works, technology reviews of ambient intelligence will be introduced as well. Chapter Three portrays the initial theoretical frameworks and ideation exploration. Through qualitative research methods, theories and study methods of UX patterns, the pleasurable product analysis and emotional needs are introduced. On the other hand, design implications will be another major subject to be discussed. Within this part, results from the theoretical analysis work are transformed into design implications and used as the basis of design concept development. Chapter Four focuses on refinement of the design process for interactive products that are specialized for home improvement activities, as well as concept development of the mobile app. Besides, evaluations of mobile app operations will be introduced.

1.5 Research Questions

The research questions were inspired from reviewing previous relevant studies, as well as observing user behaviors and working contexts. In the beginning of preparing the research, relevant studies, which include interaction design (IxD), UxD, smart homes and interaction studies of household domains were helpful for building the fundamental concepts of research directions, and several research questions were generated. Afterwards, through working on user research and interviews, the previous research questions were refined, and the major research question was established. These questions will be answered in the following chapters.

Main research question:
How are experience patterns and emotional needs of complex contexts for design analysis defined effectively?

Secondary research questions:
1. Could the analysis results support the process of design realization?
2. How can the interaction concept provide positive experiences for distinct user groups?

2/5 Background Study

> ***We should work for simple, good, undecorated things, but things which are in harmony with the human being and organically suited to the little man in the street.***
>
> *- Alvar Aalto, Finnish architect*

The purpose of this chapter is to introduce the theoretical background of home improvement activities and discuss the relevant research regarding UXD and ambient intelligence (hereafter referred to as AmI). These two domains give a rough picture of utilizing theoretical framework in home improvement contexts. The first section of this chapter will define home improvement and outline the major arguments of the thesis. Relevant studies of the household domain will also be introduced as study references, such as Smart Homes. The following section provides reviews of relevant research, which includes UXD and AmI, the two domains that form the basis of the theoretical framework in the next chapter.

2.1 Desktop Research

Home improvement is a topic that focuses on practical realizations instead of theoretical studies. There are many books and online tutorials that introduce practical working methods for renovations or structuring. However, there are very few scientific studies on this domain. According to the very limited amount of previous relevant research in the home improvement domain, this section gives the definition and overview of home improvement as well as relevant studies and researches in the context of homes through reviewing related literatures.

2.1.1 What Is Home Improvement?

Home improvement literally refers to any activity that improves the value of residential environments and raises one's quality of life (Oxford Learners' Dictionary, 2014). The Home Improvement Law of the State of Maryland, U.S., (Maryland Home Improvement Commission, 2014) gives a general explanation of home improvement:

Home improvement as the addition to or alteration, conversion, improvement, modernization, remodeling, repair, or replacement of a building or part of a building that is used or designed to be used as a residence or dwelling place or a structure adjacent to that building; or an improvement to land adjacent to the building.

Several examples could give a clearer illustration of this definition, such as painting, stucco, built-in closet organizers and kitchen renovations. Nevertheless, home improvement does not merely depend on individual work, but also hired experienced professionals to accomplish complicated renovations. Due to collaborating with the company, this thesis will only discuss individual behaviors in the context of home improvement. However, due to vague definitions of home improvement, it is hard to clearly separate the relevant topics, such as Do-It-Yourself (hereafter referred to as DIY). DIY is usually categorized as part of home improvement, but it contains a more open approach than renovating the environment..

According to Wolf and McQiutty's study, DIY is defined as "activities in which individuals engage raw and semi-raw materials and component parts to produce, transform, or reconstruct material possessions, including those drawn from the natural environment" (M. Wolf and S. McQuitty, 2011). From this definition, DIY could be seen as a kind of behavior that refers to do modifying and building things. In other words, home improvement is the context in which people can apply DIY. Moreover, DIY can be further distinguished from art and craft-making activities by project type, but it carries a home deco approach that home improvement activities do not. According to study results, in order to narrow down my focus of study and consider the company collaboration's business and product development strategies, this thesis will only concentrate on discussing the process of renovating or making additions to one's house in order to provide a clear focus of study. In actuality, renovation or building additional spaces to one' dwelling is extremely complicated and affected by various internal and external factors (Baum and Hassan, 1999). Decisions regarding adjustments made to residential environments could be seen as the outcome of housing stress and dissatisfaction. This stress or dissatisfaction is an indication of a gap between the actual and desired level of residential environment attributes. Thus, this thesis proposes the utilization of a mobile app to reduce frustration from lack of progress and increase efficiency of procedures with home improvement activities.

Figure 2-1:
Various kinds of home improvement activities, from easy to hard.

2.1.2 Relevant Studies of the Households Domain

The major argument of the thesis is helping people adjusting and renovating one's home environment to raise the quality of life through assistance from interactive products. As mentioned above, motivation or decision to proceed with renovation is the outcome of housing stress and dissatisfaction. According to Baum and Hassan's study (Baum and Hassan, 1999), once the household perceives a sufficient residential dissatisfaction, residents will choose to renovate or relocate. However, relocation is considered the alternative east able to satisfy people's needs due to financial and logistic issues. Most people may remain at their current household location and change their preference or scale down and alter to renovate to meet their housing needs and aspirations.

Nowadays, the combination of home environment and technology is already too important to ignore, and it will only become more so. In other words, the home is not only filled with economical and technical potentials for further development, but also contains possibilities to improve millions of people's daily lives (Hindus,1999). Therefore, studying technology in households has become more attractive to researchers. However, the home is a challenging design venue that needs more attention to be paid to innovations due to its variety and complexity. For instance, Smart Home is one of the popular subjects in household technology research. Since the late 1980s, a large number of information technologies have been successfully introduced into the home, (e.g., fax machines) and paved the way for more complex technologies.

Figure 2-2:
Google nest, a smart and innovative thermostat

While studying the role that technology plays in Smart Home development, two major components of home environment were defined: social space and technological space (Venkatesh, 1996)--which defines theoretical frameworks in which technology interactions happen between social and technological spaces.

Figure 2-3:
Smart plug which can operate from mobile phone

However, Smart Home focuses on utilizing interactions between the individual and household environments to improve the convenience of daily routines, but does not discuss utilizing these developed technologies to enhance renovation or improvement activities as well as methods to raise the quality of life through modifying domestic environments. Home improvement is recognized as a leisure activity with manual labor, which is increasingly involving the use of digital devices (Goodman and K. Rosner, 2011). Even the planning and working of renovation for inexperienced people could be hard and confusing, but whether users could receive assistance from digital devices or that software could aid efficiency of residents' domestic life experiences remains the question. Smart Home and home improvement activities have distinct approaches, but they should be integrated and share technological development concepts as activities to improve one's quality of domestic life. Reviewing relevant researches regarding Smart Home provided a fundamental concept for digital assistance in domestic life. Using the current technology of Smart Home to develop digital assistance for home renovations and integrating all areas into complete system could be a good opportunity to further approaches to commercial product development. How to utilize user experience as an effective tool to enhance efficiency of technology product usage will be a major consideration for designers. This is also the major argument throughout the entire thesis work.

2.2 Studies in User Experience design and Ambient Intelligence

As mentioned in chapter one, UX is not much different from experience per se, as UX also can be seen as a HCI form of experience (Hassenzahl, 2010). This section will focus mainly on the general background study of UXD. Moreover, relevant studies of AmI will be introduced as an interaction design and technology review supplement.

2.2.1 A General Introduction of User Experience Design

The term UX refers to an overall designation of how people have experienced a period of encountering a system. This view emphasizes the outcome and memories of an experience rather than its dynamic nature (Roto et al., 2011). Furthermore, the transformation of Experience to UX focuses on a particular mediator: interactive products. Moreover, HCI could be seen as the "objective" approach and experience as "subjective". Because experience emerges through situations, objects, people, their interrelationship and relationship to the experimenter. It may mean that no matter how good a product is objectively, its quality must be experienced to achieve impact (Hassenzahl, 2010). Since experience will never only focus on certain circumstances or perspectives during the process, it could be explained as "holistic". According to Hassenzahl's work, the three-level hierarchy of goals could explain this perspective. The levels from lowest to highest level are motor goals, do goals and be goals (Hassenzahl, 2010). When experience is applied to practical design, it is implied that all levels of goals will be reached.

Most people have the misunderstanding that usability and UX are the same thing, i.e., good usability equals a happy experience. This is not the truth. Traditionally, usability engineering focuses on problem solving, and removes frustration. Moreover, Blyth argues that usability was the primary objective for HCI, but traditional approaches are very limited and ignore enjoyment.

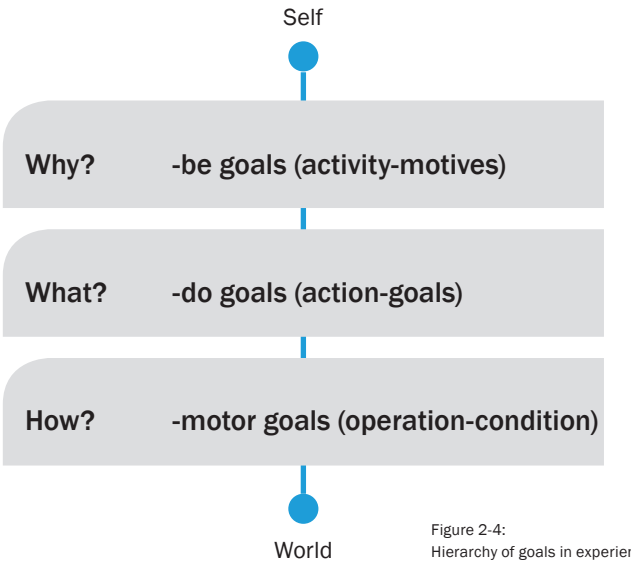


Figure 2-4:
Hierarchy of goals in experience design

HCI research and practice usually concentrates on understanding the work and the system. However, ignoring enjoyment has become the main issue that stands between computer companies and application of their products to people's daily lives (Blyth et al., 2003). On the other hand, UX builds relationship to affect and interprete meaning of products (Roto et al., 2011). In other words, some UX perspectives could be very different from traditional understandings of usability, such as social perspectives. In addition, Hassenzahl mentions in his research that we should consider experience as a design objective according to the following reason: a self-defining nature, which is the power to make us happy and energize our behavior (Hassenzahl, 2010). First, experience is something that we felt and thought of in specific situations, and it stays in our memories naturally. In other words, we can say that experience is meaningful to different individuals. Second, positive experiences bring significant efforts to improving one's wellbeing, as well as provide a foundation to improve technology to shape better experiences. Finally yet importantly, experience earns its value from satisfying mental demands. These mental needs could support technology to provide particular experiences, and they could turn the technology motivational.

UX can be viewed from different perspectives, such as a phenomenon, a field of study, and a practice (Roto et al., 2011). When UX is applied as a practice, it could be seen as a medium that provides users with functionality, usability, pleasure and pride (Jordan, 2000). However, once UX is applied in the context of the home, it is not only utilized to create an interactive product that contains smooth interaction and better usability to improving quality of life, but also interpret and affect users' emotional needs. Home is the unique space in which people would desire various kinds of distinct emotional needs to be met. Nowhere else could this characteristic be replaced . In this thesis, UX could be seen from the practice perspective. It could be used as a toolset to estimate the consequences of design decisions, as well as play a supporting role of work evaluation during and after design (Roto et al., 2011).

2.2.2 User Experience Design for Digital Products

In Garrett's study, he focues on how UXD could work in digital design practices, as well as from the perspective that "good user experience is good business" (Garrett, 2011). When people interact with a simple physical product, such as a chair or table, it is easy to deliver a suitable experience through finding the independent of the definition of the product. However, it is difficult to identify exactly the definition and succesful UX for users regardingcomplex digital products, such as mobile apps. Referring to the definition above, user expriences could be seen as an HCI form of experience. Through improving the interaction design and effeciency of communication to the system, two major dilemmas regarding the UX of utilizing digital products could be solved: helping people to work faster and make fewer mistakes. Moreover, improving efficiency could lead to improvements of productivity of the business as a whole (Garrett, 2011). In reality, business competition of digital products is very intensive. In order to attract people to use your products, efficient, conhensive, intuitive and pleasurable experiences are the key elements which designers should keep in mind.

2.2.3 A General Introduction of Ambient Intelligence

Besides talking about UX, technology reviews could also be references for design inspiration, as well as assist designers to develop interactive concepts which meet the state of the art. AmI is the major technology that is applied in the household. There are many relevant studies that introduce interesting topics in the AmI domain. However, AmI will only be described briefly and given an essential introduction within this thesis work because understanding and utilizing UX, not AmI, is the main focus Of discussion.

AmI does not only focus on specific technology, but also covers different domains of information technology studies. According to Friedewald et al.'s study, AmI refers to "the future of the information society stemming from the convergence of ubiquitous computing, ubiquitous communication and intelligent user-friendly interfaces. It puts the emphasis on user-friendliness, user-empowerment and support for human interactions" (Friedewald et al., 2004).

In the original concepts of development processes within collaboration companies, ubiquitous computing is one of the targets to focus on, which is covered by the definition of AmI. As mentioned in the previous section, many IT companies are devoted to integrating interactive technologies into the household, which is the concept of the "Smart Home". However, most of them are still looking for the best way to do it. AmI is one of the most popular domains that covers most of the technology discussion in Smart Home topics.

In Sandri's study, she indicates that AmI is the vision of a future in which environments support the people inhabiting them. This envisaged environment is unobtrusive, interconnected, adaptable, dynamic, embedded, and intelligent. In this vision, the traditional computer input and output media disappear. Instead, processors and sensors are integrated into everyday objects (Sandri, 2011). In the Smart Home context, instead of using certain input devices such as keyboards or mice, things that already exist in our daily lives should be equipped with the ability to communicate with each other. In other words, residents will not sense that many high-tech devices occupy our lives, but they will remain invisible and take our lives to another level.

AmI could enhance the quality of life through utilizing technology to improve smooth interactions between residents and devices in a household. However, home improvement is a significant part of our lives. It cannot be excluded from technology reviews. Nowadays, home improvement tools are getting smarter, and they could assist users to achieve their goals efficiently. However, when users face difficulties proceeding with improvement, will the home be smart enough to support them to do the improvement? Or, could the home improve itself through utilizing dynamic technologies? In the future, maybe through integrating user experience studies and technology reviews, the best solution will be found.

Figure 2-5:
An example of AmI from Philips Design

3/5 Theoretical Study

> ***We shape our dwellings, and afterwards our dwellings shape us.***
>
> *- Winston Churchill, British politician*

The outline of this thesis will be given in this chapter. User studies are used initiate discussion, then theoretical frameworks and methodologies of UXD research are composed as toolsets to shape analysis results and design implications. Nevertheless, current academic literatures only offer limited discussions regarding home improvement or renovation subjects, with merely small amounts providing productive results. In other words, it is increasingly difficult to utilize existing theoretical frameworks to proceed with analysis work. Therefore, grounded theory is the basic methodology of this thesis work. Furthermore, studies of psychological needs, experience patterns and pleasurable product theory are utilized to compose user insights and experiences randomly in order to form structured frameworks. These frameworks build a bridge between theoretical study and design implications, which are stepping stones to the development of design concepts.

3.1 User Studies

Introductions of user research initiate the content of this section. From defining user attributes to proceeding with in-depth and semi-structured in-depth interviews, insights from interviewees provide an overview and a realistic picture of home improvement activities. Moreover, through proceeding with interviews and observation of actual working situations in the home, major user insights were highlighted. The collaboration enterprise finished its user research in 2013 on home improvement in Germany. However, studying and analyzing research conclusions of a single culture could limit their vision for future concept development, such as ignoring cultural differences as a significant reference. Therefore, all interviews were carried out in Helsinki's metropolitan area, which provides user insights from different regional and cultural backgrounds. Moreover, the multi-nationalities of interviewees provided a diversity of experience and insights from different cultural backgrounds.

3.1.1 Defining Attributes of Potential Research Participants

Knowing and understanding people and their interactions with everything in daily life create the basis of user research work. Before setting out a concrete research plan and recruiting interviewees, creating a high-level definition of target users that I would design for and user groups for research is the first step. In the beginning, a tangible list of attributes is generated through a discussion with the collaboration enterprise, including referring to their previous user researches on home improvement. It included gender, age, living region, occupation, residence type, experience level of doing practical work and dependency level of digital devices. The experience level of doing practical work and residence types were chosen as major attributes to define users groups. The experience level of users brings significantly impacts their marketing strategies and goals.

According to their business plan, power tools were the major products that could be promoted to potential clients through the mobile app.

Knowing the experience level of users could be beneficial for the company to formulate proper business plans that fit distinct user groups. Furthermore, residence types provide significant motivation to users' renovations. As mentioned in the last chapter, major motivations of home improvement come from housing stress and dissatisfaction. However, household size, household income, dwelling age, purchase price and length of residence are external variables that affect the decision-making process of renovation (Baum and Hassan, 1999). These conditions influence users enormously in the choosing of certain types of residences. According to the results, the type of residence was selected as one of the major attributes to define users.

3.1.2 User Research Survey

This methodology is different from traditional marketing surveys (Kumar, 2013). It is a loosely constructed questionnaire, which is used for the understanding of potential users' behaviors and attitudes to home improvement activities. After conducting the list of attributes that defines user groups, these attributes are used to screen suitable participants for the research session. Based on the list of attributes mentioned in the last section, 22 closed and open-ended questions were generated. Participants were not only asked to provide specific information on aspects such as age, gender and nationality, but also details of their renovation projects, whether in progress or finished.

Google Docs was utilized as a platform to proceed with the survey. Online surveys are easy to deliver to participants all over the world. Even while in Germany, the questionnaire was still easily spread through private networks, such as among schoolmates and friends outside of campus. Not all of them are Finnish, the recipients were from all different cultural backgrounds. While delivering the questionnaire to people, clear definitions of home improvement were not given. After collecting the answers, it became obvious that everyone sees "home improvement" in very different and unique ways according to their own life experiences. They all had their own definitions of home improvement. Some participants interpreted it literally and talked about their improvement projects such as decoration and cleaning. On the other hand, few participants described home improvement activities as renovations. Because this survey was delivered through personal networks, half of the participants are students, and the other half is people who have permanent residence in the Helsinki metropolitan area. As mentioned above, half of the participants are international students, and they live in the student dormitory. These participants have done home improvement projects in their native country instead of Finland domestically. Student dormitories have very strict regulations about household renovations, and residents are even forbidden from nailing anything on the walls.

Due to this reason, they could not qualify to be research targets for this thesis, which requires participants who have done renovations in their residences.

31 people replied the survey, and 19 of the 31 responses are fully answered. According to descriptions of their projects, they included gardening, household maintenance and renovations, refurnishing and furniture repair. Moreover, there were two interior designers who were interested in the topic and answered the questionnaire. Most participants who are willing to participate in the interview and home visits were interested in this research, and would like to share their experiences working on home improvement projects.

Considering study focus of this thesis, only certain projects were selected to be the research targets. In the end, six survey participants were selected. Apart from one Finnish lady who lives in a single apartment, the rest of the participants all invited their partners or family members to join the interviews, and they were also seen as parts of the home improvement progress. Including the two interior designers, there were 15 participants in total, 9 Finnish and 6 international people from Taiwan, Austria, Canada, and Romania.

In the beginning of the user research survey, due to blurry topic definition from the collaboration company and complexity of home improvement activity, the questionnaire asked high-level and general questions instead of digging into a specific context. However, after reviewing answers from the survey participants, a rough picture started to emerge. Due to early phase of thesis work, it was not easy to narrow down the initial scope of the project with the collaboration company. If there were a chance to clarify topic definition clearly, it would have been very helpful to staying in focus while forming the content of the survey and recruiting channels.

3.1.3 Interviews on People who Work in Home Improvement Projects

3.1.3.1 Description of Research Participants

As mentioned above, there were 15 international participants of the user research. In total, seven interviews were conducted. All interviewees have distinct lives and work backgrounds, as well as attitudes to home improvement. Even participants already reflected details of their improvement projects in the survey, but several key points are still missing. In order to understand detailed reflection of their experiences during improvement activities through conversation, as well as observing locations those participants worked, proceeding with interview is necessary.

Based on the results of the questionnaire, the survey participants (besides the interior designers and their partners) could be categorized into three groups:

1. Those that are engaged in home improvement activities only if they need to
2. Those that are rather inexperienced, but enjoy making their living space more beautiful through home improvement activities
3. Those who include home improvement as one of their favorite hobbies

3.1.3.2 Consideration of Interview

None of the home improvement projects are exactly the same even if the final goals lean toward the same direction, which is to improve the quality of life. Therefore, the process of each project was very different. The interview guidelines are semi-structured and based on the answers of the questionnaire.

All the seven interviews were carried out in each participant's household. Besides observing their home environment and working examples, it was also easier for them to feel relaxed when answering the questions. Here, one of the interviews is used as an example to introduce the general process of interview: An international married couple, Elisa and Timo (names changed) who is doing a kitchen renovation.

Background and Motivation of the Renovation

The couple introduced themselves first, and showed me the working space. Elisa is from Taiwan, and she married Timo, a Finnish man, eight years ago. They have a three-year-old son, and live in a small town, which is 50km away from Helsinki. Elisa is a housewife, but she is also a writer and already has several books published. Timo works for a renovation company as a sales person, and he has to travel a lot for work. They bought and moved into their current apartment three years ago due to the sudden relocation of Timo's job. Initially, they didn't plan to live here for long. However, as time went by, they started to think about living in the apartment longer since Timo's employer would like to ask him to stay in the current location for a longer period. This apartment was built in the 1950s, and the state of the house is not very nice due to cheap building materials. This is especially obvious in the kitchen, where the functionalities of the cabinets and electricity supply could no longer support their demands. Building a new kitchen and having a better quality of life was their motivation for home improvement.

Previous Experiences of Renovation

Elisa and Timo discussed their experiences of home improvement. As a sales person in a renovation company, Timo is proficient at renovation and has basic skills utilizing tools and picking out suitable materials. However, Elisa is on the opposite side of the experience level. Due to her native culture, she has never done any renovation work in her life. In Taiwan, she was told, “renovation is a man’s job, and women shouldn’t do it!” Due to this reason, she did not have any previous knowledge of renovation, tools or materials. While they proceeded with this kitchen renovation, they both realized that cultural differences actually influenced the planning and workload.

Figure 3-1:
Elisa and Timo’s kitchen before renovation

Delegation of Workload

When they described their roles in this renovation, Elisa was very honest. She said: “I don’t know how to do the work, so I have to ask Timo to do everything. I’m very sorry about my absence, but I need to take care of our son, and I don’t want to bring him trouble because of my lack of knowledge about it (using tools and working methods).” Timo also reflected, “I felt very tired during this renovation, since I have to do it alone most of the time, and I also have a lot of work to do. This activity just took out all of the joy of improving my own house.” I can tell that Timo did not blame Elisa, but they were both exhausted and hoped to find a way out of this frustrating phenomenon.

Figure 3-2
IKEA kitchen cabinet set

Gender

I also asked them about the effects of certain variables, such as gender and kids. Both of them reflect that these variables did not affect their renovation planning in any way besides the need to settle their son somewhere else during renovation due to dust and chemical solvents being harmful to the child. They did not think gender would affect the renovation. Timo actually likes to do handiwork as a form of recreation. This was one of the reasons for him to do this renovation and take over most of the practical work. For Elisa, she likes writing and music, and is rarely interested in handiwork. They concluded that doing renovation really depends on personal interests and has nothing to do with gender.

Figure 3-3:
Repainted wall in Elisa and Timo's kitchen

Purchasing Decisions

When Elisa and Timo thought about purchasing new cabinets and home appliances, the major considerations were the price and convenience of assembly. This apartment will not be their life-long residence, and it is not possible for them to put too much effort into renovation work in a building that is made of cheap materials. Therefore, they decided to purchase IKEA kitchen cabinets.

Reworking

When Timo asked his parents and friends to come over to help him to assemble the cabinets, no one realized there was a special method introduced in the manual for the assembling of parts, even though they were all experienced in renovation. Eventually, they had to tear apart all the pieces and reassembly.

Companionship During Work

They were given several options, such as a guardian angel, a group of friends, an instructor, and a song that they can enjoy. Both Elisa and Timo choose an instructor. For Elisa, she desires someone to instruct her while renovating so that she could learning knowledge while doing it. Timo would like to prevent rework situations from happening.

Time and Schedule Management

Timo mentioned that he has to deal with his busy work and used spare time to do this renovation. However, he could not manage to balance regular life and this renovation. One reason is the complexity of the project. The huge amount of tasks and electric planning made him very confused over where to start.

Frustrating and Enjoyable Moments

At the end of the interview, Elisa and Timo mentioned their frustrating and enjoyable moments while working on this renovation. They felt frustrating at different points. Elisa felt frustrated at having less to contribute due to lack of renovation knowledge, and Timo felt that renovation was very time consuming, and he did not know when it would be finished. However, both of them felt enjoyment when imagining a brand new kitchen that they could eventually enjoy cooking in.

Elisa and Timo's story provided an example of the interview process, and all seven interviews share similar structures. However, as mentioned at the beginning, every renovation work is unique, and this structure was adjusted accordingly. Nevertheless, participants provided working examples while replying tto he questionnaire, though some of them changed their minds when describing another improvement project when I started to talk to them.

Figure 3-4:
Assemblied new kitchen cabinet in Elisa and Timo's kitchen

3.1.4 Interviews with Interior Designers

Besides talking to people who proceed with home improvement projects, I also invited two interior designers to participate in the user research. They provided different perspectives to the renovation work from the non-professional people during the interview.

Nina and Claudia (assumed names) are master students of spatial design in Aalto University, Finland. Both of them did several interior design and renovation projects while they were working in the industry. Nina is from Canada, and did spatial projects in North America. Claudia is from Austria, and she mainly did her project in Germany and Austria. While they proceeded with renovation projects, understanding clients' initial motivations and requirements were the most important. However, it is not easy work. People who want to hire designers to renovate their house usually do not have a clear picture or understanding of their own demands or daily lifestyle. It is very challenging for interior designers when their clients could not give distinct references for concept designs.

From their perspective, improving one's house does not only bring better functionality and quality, but something that fits one's personality and living habits. Moreover, this enables residents to build their emotional connections to the cold and inorganic building. According to their actual working and consulting experiences, here are the key points of doing renovation that Nina and Claudia would like to share with non-experts.

1. Home interior designs should fit your personal living habits.
2. Renovation is not about destroying old things totally, but building new things on top of it.
3. When you want to do any improvement projects, talk to someone experienced. You don't need to do a lot of research, but sort your thoughts through talking. Don't think alone.

3.1.5 Observation of Home Improvement in Action

Through talking with interviewees about their projects, an overview of experiences in the home improvement activity context was established. However, "seeing is believing." Observing the actual working process is still necessary for the research. As mentioned in the last chapter, experiences are self-motivated (Hassenzahl, 2010), people do not need to remember them in purpose, experiences will automatically stay in their head. However, only listening to people describing their experiences could not allow you to see the truth and holistic fact, or people's behaviors during certain circumstances. According to this reason, I observed one of the interviewee's working processes. Amy and Mikko (Assumed names) are a couple and live in a rental apartment. They plan to paint a wall in their living room, and have already shared their planning experience during the interview. I had a chance to observe their painting process.

Figure 3-5:
Proceeding with project of painting wall

Video ethnography was utilized as a major method to observe a user's behavior. The objective is to capture people's activities and what happens in a situation on video so it can be analyzed to recognize behavior patterns and insights (Kumar, 2013). Some events are significant during this observation, and they could be good comparisons to a user's estimation and actual situations. First of all, material demands are way higher than original expectations. They did measurements of wall sizes and consulted with shopping assistants in paint shops. The assistant suggested to them the amount of paint they should buy, but it still was not enough, and they did not prepare for more. Due to this issue, they needed to postpone their working schedule. This issue triggered a series of negative experiences afterwards, like a chain reaction. After postponing the working schedule and adding one more shopping trip to the paint shop, the couple had had to live with an unfinished wall for some days, and they were suffering. When they started to paint again, serious arguments happened. Mikko argued with Amy about her working methods, and Amy thought Mikko did not have sympathy. The whole process seemed impossible to finish. Eventually, they finished the work, and these arguments were gone after the mess and the entire living room were cleaned up.

Amy confessed that she did not think painting a wall could be frustrating and hard. She expected all work to be done in one day, but in fact, it extended to one week, including finding a time to go to the paint shop again after work.

Figure 3-6
Finishing painting

3.1.6 Defining User Groups

During interviews, the participants' partners were also asked to put themselves within these groups, and most of them claimed that the second user group definition (Those that are rather inexperienced, but enjoy making their living space more beautiful through home improvement activities) fits them better. According to the descriptions above, participants of the user research could be categorized into these three major groups: the Novice, Pragmatist and Enthusiast. The definitions of the user groups were based on the working attitudes and motivations of home improvement.

As mentioned when defining users, two major attributes define the study target of this thesis: the experience level of doing practical work and types of residence. Based on the two attributes, a diagram of participants was constructed.

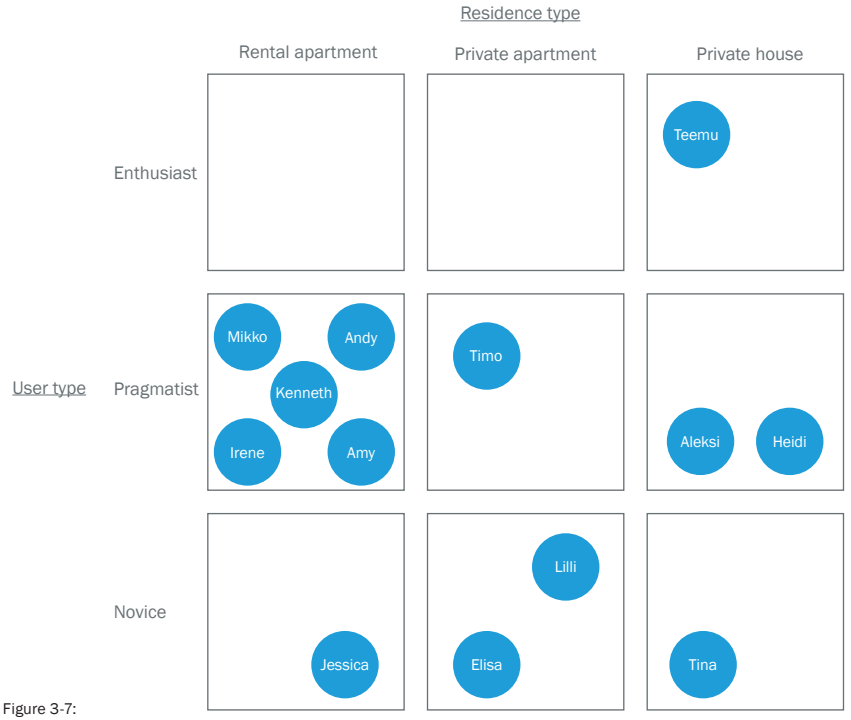


Figure 3-7:
Diagram of defining interviewees' user group

Figure 3-8:
Participants of user research and interviews

3.2 Methodologies and Theories for Analysis

As mentioned at the beginning of the chapter, few academic researches further discuss home improvement relevant domains. This thesis is based on qualitative research, utilizes grounded theory as the initial method used to examine raw data, and integrates other theoretical frameworks as major tools to shape user research insights to results.

3.2.1 Grounded Theory

Grounded theory is a general methodology for developing theory that is grounded in data systematically gathered and analyzed (Strauss and Corbin, 1994). This methodology usually involves generating theory and doing social research. Moreover, theories could be generated initially from analyzing raw data, as well as elaborating and modifying existing theories that might be suitable to the domain of investigation. Sources of raw data usually come from interviews, field observation and relevant documents, such as diaries or newspapers. In Strauss and Corbin's study (Strauss and Corbin, 1990), procedures of grounded theory to a project work are introduced. There are 11 procedures introduced, and they have become the principles of data analyzing and conceptualizing.

Why is grounded theory so important to this thesis? First of all, user interviews and field observations are the foundations of the thesis. Massive amounts of qualitative data would need a methodology to analyze and transform them into concepts. Based on this consideration, grounded theory becomes the one ideal methodology to utilize. Moreover, there are few relevant studies that discuss renovation activities in home improvement. In addition, these studies focus on examining the phenomenon of renovation (Baum and Hassan, 1999), HCI applications within a home improvement context (Taylor et al., 2008) and technology designs focused on the home (Hindus,1999).

From a user experience perspective to studies in home improvement or within the renovation context, grounded theory is helpful to the analysis and conceptualization of data.

Based on Strauss and Corbin's description, ground theory's procedures force the practitioner to ask, and its openness allows practitioners to respond to and change with the time (Strauss and Corbin, 1994). According to these characteristics of grounded theory, integrating other theories and leaving the way open for further development of analysis work is possible.

3.2.2 Emotional Needs in UXD

When experience is discussed, discussion about psychological needs cannot be excluded. After people go through an event, they transform the memories into meaningful experiences. However, the meaning and positive experiences of the events are deduced from their feeling and mental satisfactions. Hence, psychological needs are considered as a way to ascertain that an experience is positive and personally meaningful (Hassezahl et al., 2013).

Sheldon et al. summarized psychological needs theory into a set with 10 mental needs. They are fundamental for human beings (Sheldon et al., 2001). In Hassenzahl et al.'s study (Hassenzahl et al., 2013), they narrow down 10 needs to a essential set which contains six major psychological needs: autonomy, competence, relatedness, popularity, stimulation and security. This set is built on the practical study within the context of IxD, and they can be understood as potential sources of positivity and ultimate happiness when fulfilled.

This thesis work is involves an interaction design which is based on UXD research. Thus, the six major psychological needs becomes attributes to categorize and evaluate which needs are most significant to the people who proceed with home improvement. Key experiences are defined as results of grounded theory analysis, and this set of essential psychological needs could categorize experiences into different needs. Through reviewing the results of the categories, a designer could understand which mental need they could shape when utilizing their design.

Autonomy

Feeling that you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action

Popularity

Feeling that you are liked, respected, and have influence over others rather than feeling like a person whose advice or opinion nobody is interstedin

Competence

Feeling that you are very capable and effective in youractions rather than feeling incompletent or ineffective

Stimulation

Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and understimulated by life

Relatedness

Feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared for.

Security

Feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances

Figure 3-9:
Emotional demands set for experience design

3.2.3 Moments of User Experiences

This section describes the theoretical framework that Hassenzahl et al. examines in their experience design research work: Experience patterns (Hassenzahl et al., 2013). This framework was chosen as the major skeleton of this thesis, and it brings new ideas to the conceptualization of user study results.

In recent decades, design for wellbeing has become a popular discussion in the design industry. Designers devote time to creating products that can bring not only a high quality of life, but also psychological satisfaction. With this phenomenon, “Designing for happiness” has become another interesting topic, but it is challenging. How can we design for invisible emotional needs? This theoretical framework might help designers to find answers. In this framework, experience design is described as a significant approach to realizing pleasurable and meaningful moments at the center of all design efforts. Furthermore, he mentioned that psychological needs are ways to understand and categorize experiences, and “experience patterns” could be the tool to distill the “essence” of an experience and inscribe it into artifacts. This pattern is more general than a particular experience and can be applied to different contexts, resulting in different artifacts.

Through Hassenzahl’s study of an interactive product “Be-Near-Me TV”, he suggests that the structure of experience contains three phases (i.e., anticipation, event, cooling-off), important time points (i.e., the appointment, the beginning of the event), and some general rules or norms (i.e., don’t interact too much during the event, talk about the event in the cooling-off phase, don’t miss a part).

Figure 3-10
Three phases of experience pattern

Patterns can have different sources. It can be thought of as analytical summaries of empirically gathered positive experiences. Moreover, it could be based on a few autobiographical experiences or taken from fiction. Yet, can these different sources be valid for the pattern? A good pattern is at the foremost plausible and resonates with others. Resonance is a feeling of recognition and affirmation by the person who uses the pattern.

While taking experience patterns as a tool to dig deeply into resonance, Hassenzahl et al. mentioned two design arenas to design for happiness—first, from patterns to experiences, and second, shaping experiences through the material. To design a novel experience based on the knowledge about a happy moment captured by the pattern (arena 1), we should then take this a step further by discussing how to create and shape this experience through the material (arena 2). They mentioned that experiences should come first, and the material should be chosen solely for the benefit of the experiences. Based on the following reasons, this framework could be beneficial for designers and perfectly fit into multi-task orientated design projects that involve complex processes, such as home improvement.

1. Assist designers to understand the holistic process without being overwhelmed instead of looking into a single event and generate highly specified solutions.
Many home deco magazines and websites introduce fancy and beautiful interior design to people who are not equipped with the ability or knowledge for doing renovations and improvement. It causes most people to see home improvement as a once-in-a-lifetime event, and only rivet on preparing hands-on work. However, the actual situation is much more complicated than its simple surface. In fact, an improvement activity could be seen as a no-end cycle in everyone's life. When you are still breathing, the desire to improve the quality of life never disappears. Even if you paint your wall today, you might need to do it again after ten years once the paint starts to peel from the walls. This confusing dilemma affects users' experiences and mindsets. Designers can utilize this framework to capture users' key reflections in the entire process, and think about broader concepts instead focusing on technology

reviews and developing fancy interaction design concepts to attract users' attention.

2. Designers could shape users' experiences more precisely between similar types of activities in the same domain
As mentioned above, experience patterns illustrate a clear picture of users' positive and negative experiences at individual time points and phases that designers can take as references to develop design concepts. For instance, planning an improvement activity is actually much more complicated than working on it. However, general users only know that doing hands-on work in the improvement process is not easy and usually comes with frustration. This framework could support designers to handle the major experiences in the activity, and generate design concept to shape it.

Nevertheless, while the experience pattern is a tool which could be innovative and beneficial to designers' thinking, there is still some concerns with its utilization. On one hand, the material and the experiential are two sides of the same coin. The material is the tangible arrangement of technology; the experiences are the meaningful, positive moments, which are created through interacting with this arrangement. However, if increasing happiness becomes the primary objective of an artifact, designers should shift some of their resources away from the material representation (the second arena) to the experiences created (Hassezahl, 2013). On the other hand, while utilizing the experience pattern, there could be two crucial attributes. First, these patterns are idealized. Designing for happiness is the goal for designers to utilize this pattern. However, once we only look into the needs that we would like to satisfy, it could go beyond each experience, and designers might assign experiences instead of describing them. Second, the pattern links a need within certain contexts. Psychological needs are universal and abstract, and the pattern is located in between the needs and a certain context. However, once the need clearly refers to a certain context, then the particular practice can only serve the need and be constrained by the situation (Hassezahl, 2013)

3.2.4 Designing Pleasurable Products

Patrick W. Jordan's theory explains emotional, hedonic and practical benefits associated with products. In this thesis work, "the four pleasures" framework is utilized (Jordan, 2000) to consider pleasure within the mobile app. Jordan mentioned that pleasure-based approaches to product design could be seen as approaches that consider all the potential benefits that a product can deliver. The four pleasures in this framework are: physio-pleasure, socio-pleasure, psycho-pleasure and ideo-pleasure.

Physio-pleasure is to do with the body and with pleasure derived from the sensory organs, as well as feelings of sensual pleasure. Socio-pleasure is the enjoyment derived from relationships with others. It could be the relationship with close friends, but also relationships with the whole society. Psycho-pleasure pertains to people's cognitive and emotional reactions. Ideo-pleasure pertains to people's values. For instance, sustainable products can make the user feel him or herself to be environmentally friendly.

Through reviewing this framework, its relationship to other frameworks could be found. As mentioned above, "designing for happiness" is a significant goal for designers. After understanding human psychological needs and patterns of user experiences, pleasurable interactions between the product and users should be studied. Furthermore, in the context of home improvement, products that assist people to put effort into the works need to provide positive emotions, such as excitement, interest, fun or confidence. This framework provides a platform to understand positive emotions and explore the relationship between user experiences and pleasure.

The three theoretical frameworks mentioned above connect to each other and build the concrete skeleton of the entire thesis. As mentioned in the previous chapter, people's experiences are significantly affected by personal emotional demands of certain events. Therefore, before discussing and proceeding with the analysis work, understanding the interrelationship between experiences and emotions is important. In the next section, these frameworks will be utilized as tools to organize and analysis raw data from the user research.

3.3 Analysis

In this section, results of the analysis will be introduced. Based on theoretical frameworks in the last section, raw data from user studies are transformed into info graphics to represent the research conclusions. These results form the basis of the design implications.

3.3.1 Categorizing User Experiences and Insights

In section 3.2.1, grounded theory was introduced as a method to analyze and conceptualize raw data. During user research, all the conversations and key reflections were filmed, recorded and noted. Still, the significant information in these video and audio files, also in the handwritten notes, were spread everywhere. In order to extract the essential parts from the massive volume of information, transcribing audio contents into text descriptions and listing user experiences and insights as bullet points became the initial point of analysis.

After transcribing all interviews, I started to review contents. I composed categorizing work into two stages, starting from filtering insights of transcriptions into categories, selecting key insights and experiences and finally putting them into different phases in the experience pattern. In the first stage, all interviews had distinct renovation topics, but surprisingly, different participants reflected similar insights and experiences regarding their own improvement process. I utilized a mind map to sort key insights from transcription into rough and intuitive categories, and picked out overlapping experiences and insights.

In this initial step of filtering the data, there were no clear or tangible results that could be used efficiently to conclude any findings. However, several rough categories which participants focused on could already be seen.

In the second stage, I reviewed individual transcripts separately, and picked up key experiences and insights from the bullet points based on the filter results in the mind map. Not only the map, but also the handwritten notes during interviews were references to defining key points. Key insights and experiences in independent interviews were selected through reviewing the data. After this stage of work, a lot of bullet points were waiting to be organized in a way that can be seen in a clear frame.

Figure 3-11:
First round of categorizing insights from interviews

3.3.2 The Experience Pattern and Experience Journey Map

As mentioned in previous sections, this pattern is the major framework of the thesis. It follows Hassenzahl et al.'s (2013) research results, and experience design is described as the significant approach to realizing pleasurable and meaningful moments at the center of all design efforts. In this section, details of experience pattern will be introduced, as well as general norms and opportunity points.

Taking the results described in the last sections into account, I located these points in three phases of the experience pattern. Based on the context, the three phases were defined as: planning, working and reflecting. In Hassenzahl et al.'s (2013) research work, the three phases of the experience pattern were defined as anticipation, the event and the cooling period. I took this definition and revised it into the context of home improvement.

Based on the categorized results of user experiences and insights in the different phases, I started to organize activity timelines for individual study cases. During interviews, participants did not only explain their experiences and give insights into their projects, but also the entire process and other major activities. According to their reflections, a basic structure of project timelines was formed. However, even though each project has its own unique characteristics, some common points could link all individual interviews. On one hand, creating timelines to map participants' behaviors at different time points and phases were helpful to seeing an overview of general behavior, activities and experiences. On the other hand, generating the timeline with participants' insights and experiences in the pattern was helpful to proceeding with project comparisons between different contexts triggered by similar motivations. Based on analysis results on individual timelines from distinct projects, a pattern, which could be applied on each individual project, was created. This pattern is the analysis result from comparisons between different improvement projects.

As mentioned above, each project has its own unique process. However, the major behaviors and actions are common between them. After extracting common time points from each project, a general timeline was formed. Basically, all the projects contain these time points in their improvement activities, and more or less the participants reflect their pleasurable or unpleasant experiences at each time point. Within these time points, participants reflected most of their experiences at a certain time point. I called it the "opportunity point".

Once the quantities of pressure were equal or more than pleasure at a certain time point, it could be seen as an opportunity point. The major concept of the mobile app is assisting users with their home improvement activities and enhancing positive experiences within the entire process. Based on this, the time points at which users feel helpless or annoyed during improvement, the mobile app could enhance and raise their positive mood and support users with practical help.

If the experience pattern could be seen as a person, then according to the analysis results above, the phases, timelines are parts of the skeleton, the user experiences could be seen as the outlook, and general norms within improvement activities could be seen as organs. They provide discipline and sustain the entire pattern so that it works smoothly. As its name suggests, general norms are principles that participants follow during improvement projects. These norms are based on behaviors and considerations that participants reflected on during interviews. However, they cannot be defined as experiences because there are no emotional elements included. Besides, these norms can be seen as factors that affect users' experiences as well. For instance, the participants considered following practical variables as their references before proceeding with any decision-making during the planning phase: durability, aesthetics, atmosphere, quality, usability, price, expert suggestions and task levels. These variables could be seen as part of the norm. Moreover, the participants' experiences were also affected by these norms in different phases.

General norms do not only exist in individual phases, but also go through the entire improvement activity. For instance, flexibility is the most significant norm that applies to the entire progress. When reviewing participants' reflections during interviews, flexibility was not only mentioned in the planning phase, such as scheduling, material preparation and budget planning. It was also considered in the working phase, such as workload sharing and task management. It affects the participants' behaviors and experiences within the entire pattern enormously. The time points in this experience pattern could be classified into more detailed stages. Each time point represents the users' certain behaviors and experiences, but they all have similar attributes. All time points can be distributed into twelve stages within the different phases, and this analysis will be the foundation of the experience journey map, which will be explained in the following section.

While working on analyzing the experience mapping, coincidentally, I found that customer journey maps could be helpful in assisting the mapping out of the participants' experiences. A customer journey map provides a vivid but structured visualization of a service user's experience. This could also build an engaging story based upon their experience (Stickdorn M. and Schneider J., 2013). Based on the concept of the customer journey, the "experience journey map" was created. The customer journey is one of the basic methods service designers use to look into touch points to explore users' needs. Home improvement can also be seen as a journey, since it has a beginning and an end in a single project. Within ths journey map, the experience pattern is combined in order to reflect participants' experiences and emotions in a rational way.

General norms within entire process

Being ready to planning the next improvement project while working on current one.
Keep breathing space and flexibility for any work.
Result of improvement should make residents to feel comfortable to live with it for long time period.

General norms within different phases

	Planning phase	Working phase	Reflecting phase
Behaviors	• Sharing working load and concept • Taking balance between ideal and realistic • Management for many things at the same moment • Experiement with material • Ophthalmoception and tactioception • Imaging future scenario	• Do not work alone • Gender affects physical working	
Considerations	• Durability • Tool rental • Aesthetic • Atmosphere • Quality • Usability • Price • Expert suggestion • Task level	• Instructor	• Maintenance

Figure 3-12:
General norms of experience pattern

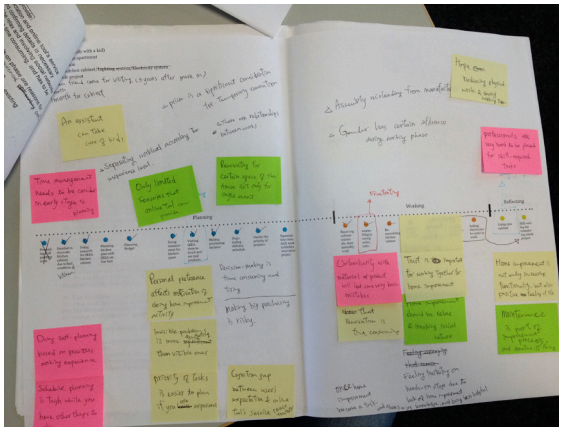


Figure 3-13:
Timeline of individual interview

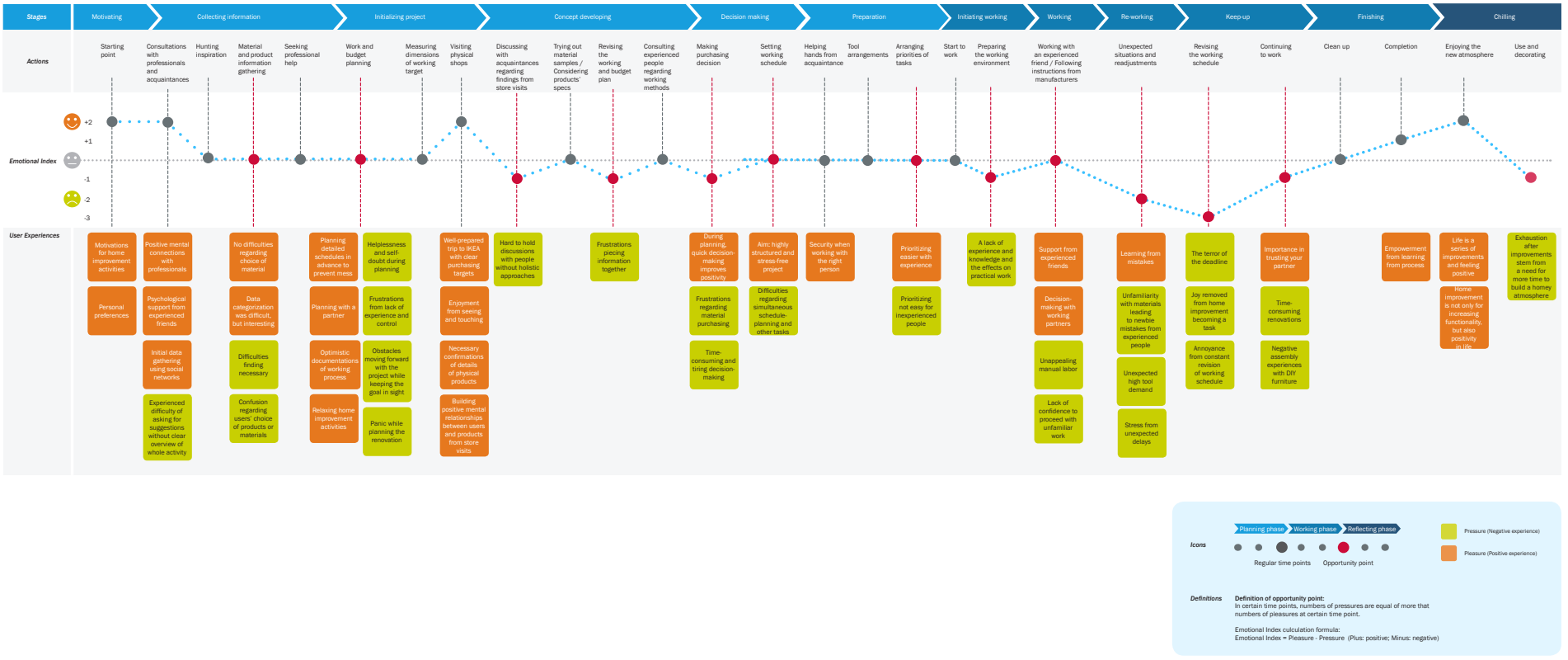


Figure 3-14:
Experience pattern and experience journey

In the previous analysis, the experience pattern expressed pleasure and pressure experiences as time points, which also defined the opportunity points. However, this experience journey map only utilizes single stage's experience instead of at each time point. Stages in the experience pattern are collages of time points which have similar attributes and behaviors, and it could also be seen as a summary of pleasure and pressure experiences at different time points. This map was made from collecting 15 participants' experiences. There should be certain numbers of participants for the result of this analysis method to be recognized as effective. However, one single survey did not provide the minimum number of participants for the findings to be considered scientifically effective.

The formula of calculating this map:

(The amount of pleasure in single stage) - (The amount of pressure in the same stage) = Level of pleasure or pressure.

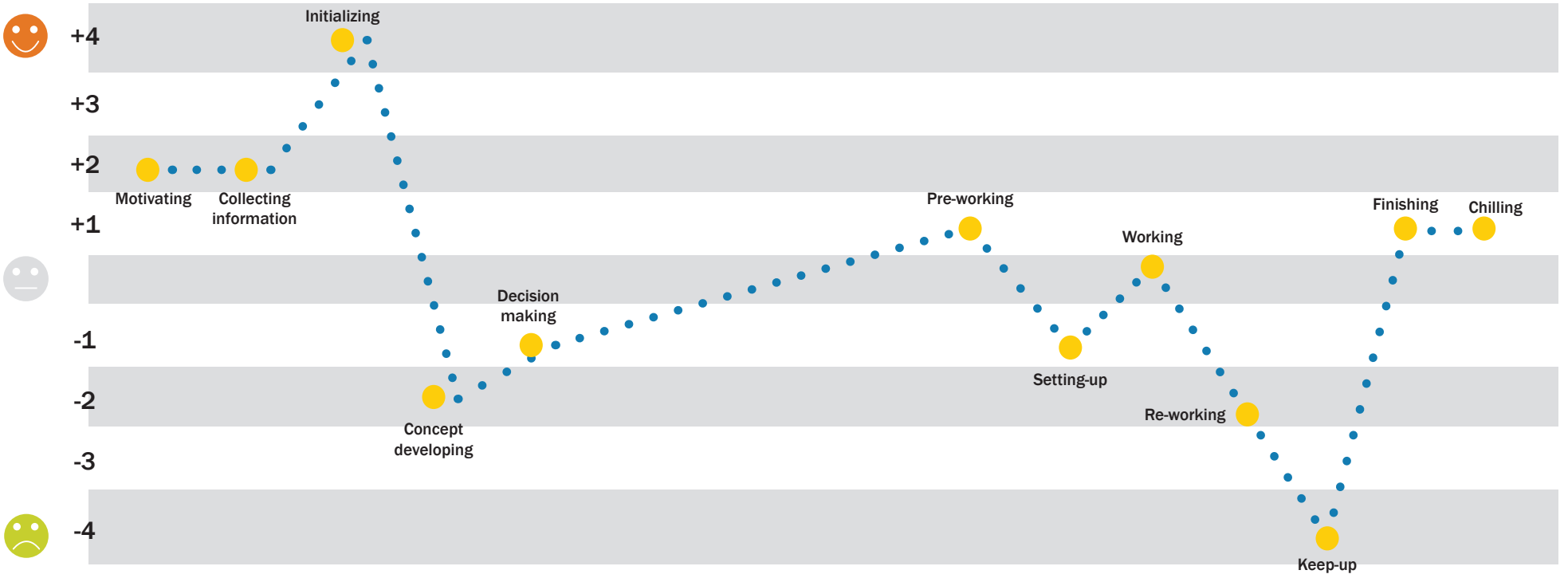


Figure 3-15:
Experience journey of each stages in home improvement activity

3.3.3 Emotional Demands

As mentioned in previous sections, psychological needs cannot be excluded from discussions of user experience. While people went through the event, they will transform their feelings to meaningful experiences. Based on the definition of Hassenzahl's emotional needs set (Hassenzahl et al., 2013), the six major psychological needs: autonomy, competence, relatedness, popularity, stimulation and security were utilized as categories to classify pleasure and pressure experiences.

In this emotional needs set, each emotion has its own definition. The diagram shows that autonomy, competence and stimulation are the key psychological needs in the context of the entire home improvement project. In this analysis, not only the pleasure experiences were counted, but also the pressure experiences. For instance, the pressure experiences were concentrated in the categories of autonomy, competence and stimulation in the working phase. This could mean that the participants' emotional needs were hugely unsatisfied within these three aspects.

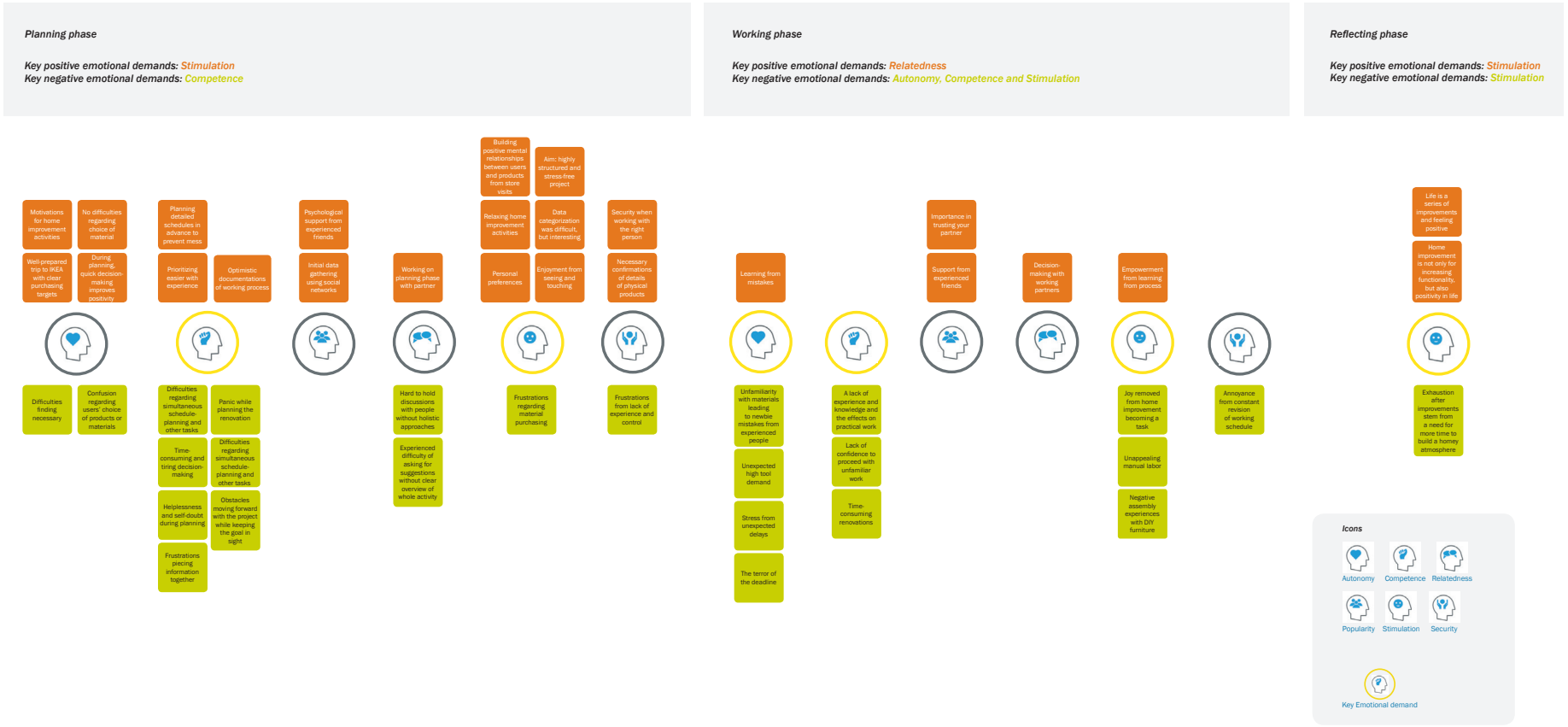


Figure 3-16:
Emotional demands map

3.3.4 Pleasure and Pressure Diagrams

Experiences contain positive and negative emotions. According to Jordan's theory, I named the positive experience pleasure. On the contrary, the negative experiences were named pressure. In section 3.2.4, Jordan's pleasurable product theory was introduced. Based on his research, I transformed the principles and designed the two by two "pleasure and pressure diagram" to define the locations of major pleasure and pressure, as well as the emotional demands of a certain quadrant . Through this method, the most significant elements that affect users' perceptions of pleasure and pressure could be seen. The materials of this analysis work come from the analysis results of the previous section: emotional demands.

Jordan explained four pleasure definitions in his study. However, he focused on studying products' positive experiences, and did not mention how designers could deal with negative experiences. In this thesis, I do not only look into the possibility of bringing pleasure to users through design concepts, but also study pressure in order to understand the reason that the concepts could support and transform negative to positive emotions. According to the descriptions of experiences, positions of pleasure and pressure will be decided through the following definitions:

Pleasure:

Physio pleasure: To do with the body and with pleasures derived from the sensory organs

Socio pleasure: The enjoyment derived from relationships with others

Psyco pleasure: Pertains to people's cognitive and emotional reactions

Ideo pleasure: Pertains to people's values

Pressure:

Physio pressure: To do with the body and with pressure obtained from the sensory organs

Socio pressure: Getting emotional tension from relationships with others

Psyco pressure: Negative cognitive and emotional reactions

Ideo pressure: Negations of people's values

Steps to utilize these diagrams are:

1. Take the emotional demand map and start to categorize pleasure and pressurethrough the following definitions above. Two diagrams will be generated from this step.

2. Replace descriptions of pleasure and pressure with emotional demands. Two diagrams will be generated from this step.

2. After observing the situation of those four diagrams, pick the most concentrated quadrant from the experience diagrams.

3. After observing the situation of these four diagrams, pick the most concentrated quadrant from the emotional demands diagrams.

4. After defining the most concentrated quadrant, observe the spreading tendency of the experience and emotional demands, and build the conclusion of the observation.

Through utilizing this method to categorize user experiences, several conclusions are generated, and will be introduced in section 3.4.4.

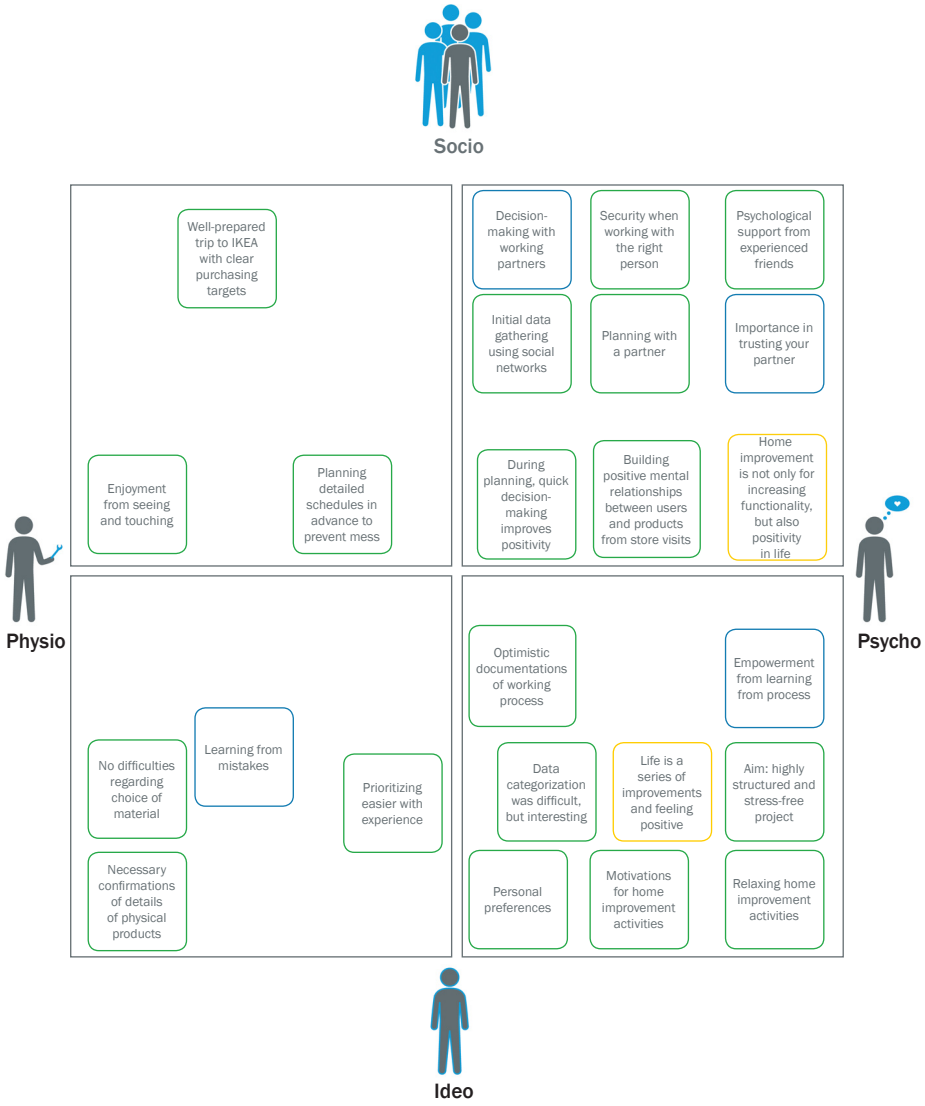


Figure 3-17:
Pleasure diagram

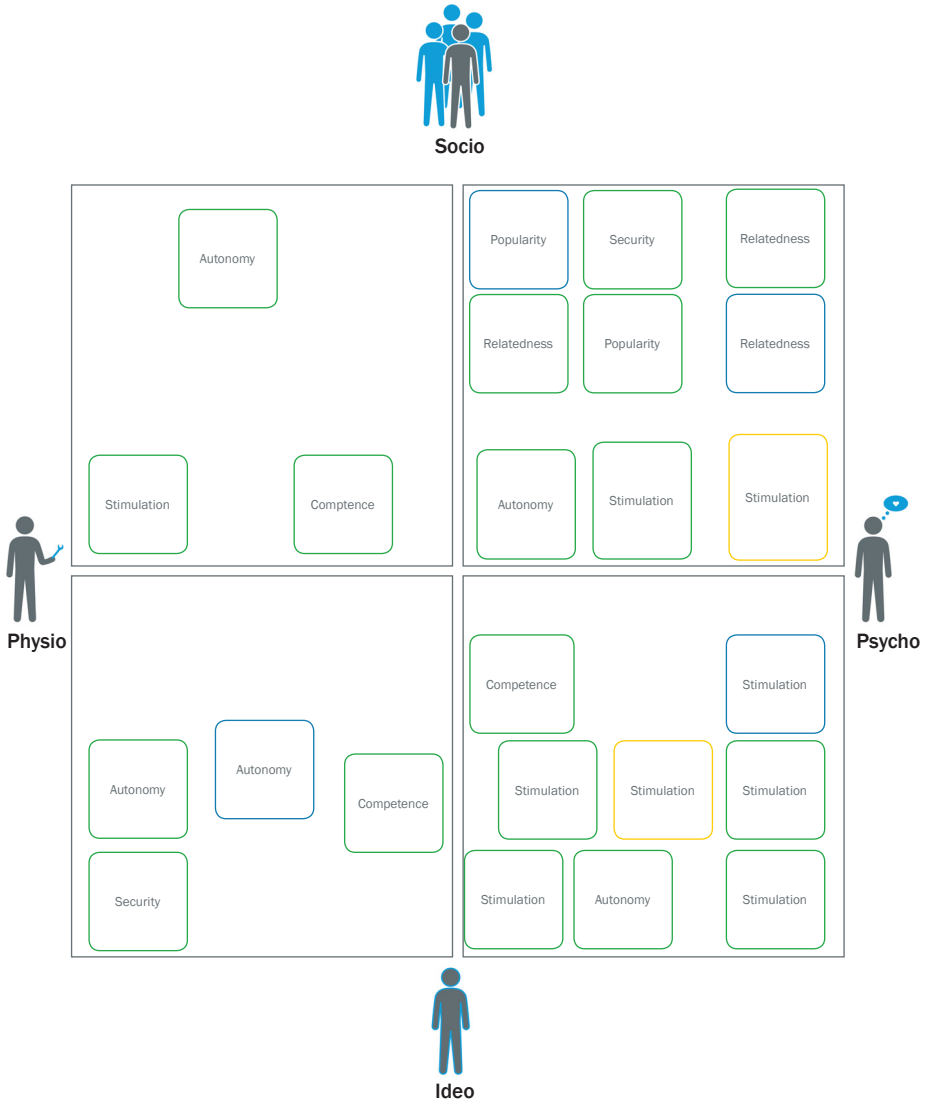


Figure 3-18:
Emotion diagram of pleasure

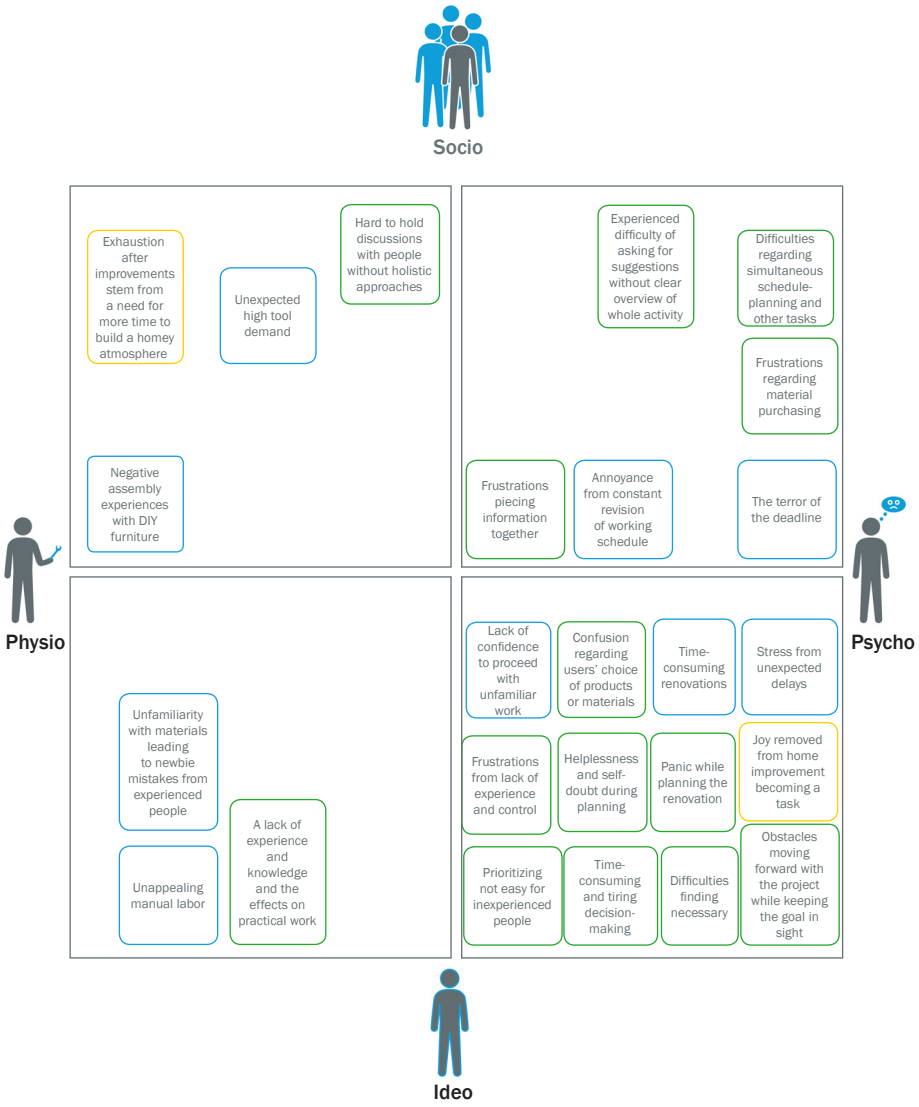


Figure 3-19:
Pressure diagram

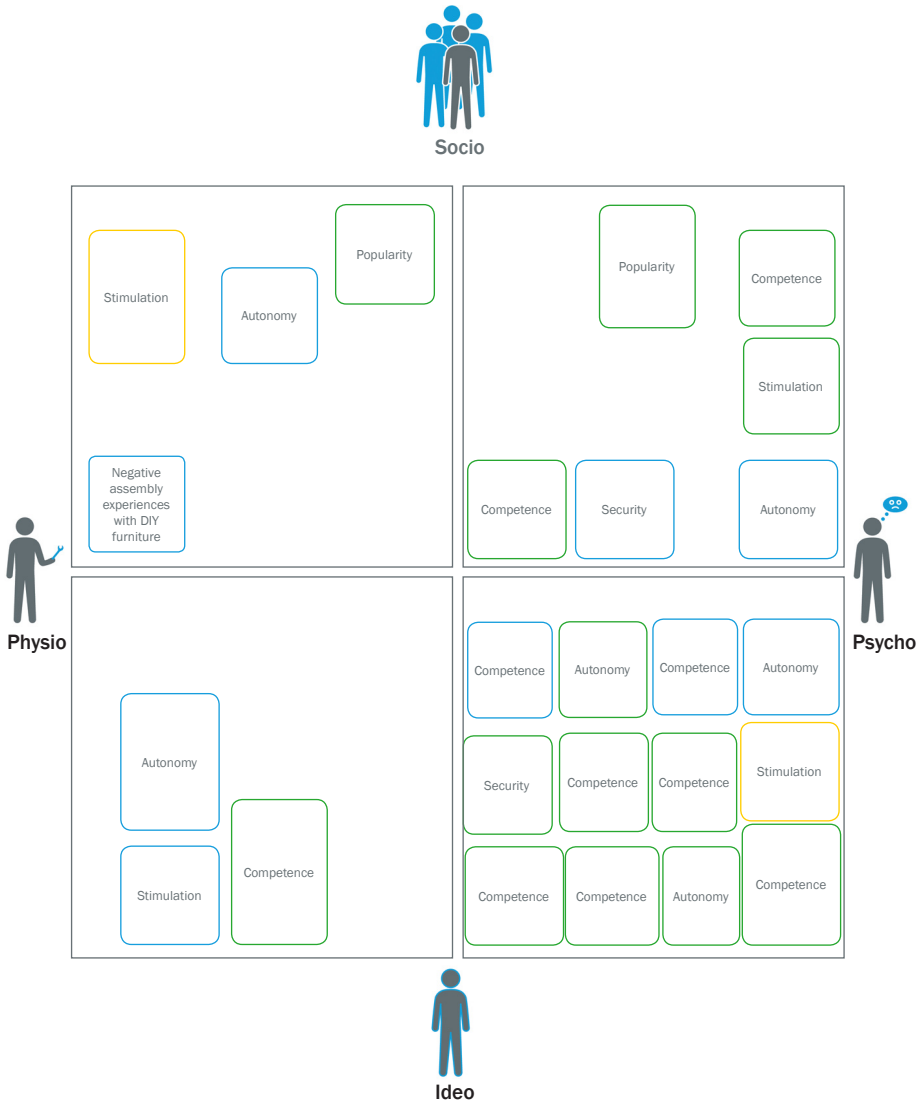


Figure 3-20:
Emotion diagram of pressure

3.4 Findings from the Analysis

Within this section, significant findings through analysis methods in previous section will be presented. Based on findings from individual methods, top findings are generated as summaries of analysis works.

3.4.1 Results of Categorizing Insights

There are still no clear conclusions after classifying the raw data into clear and certain phases of the experience pattern. Nevertheless, through following grounded theory principles, essential information was filtered from a massive volume of data, and a general overview of participants' major experiences could be seen. During interviews, I also asked users to reflect on their frustrating and enjoyable moments during home improvement projects. These moments were assorted into the three phases of the experience pattern, and the graph displays the primary concept of the participants' positive and negative experiences in different phases.

3.4.2 Benefits from the Experience Pattern and Experience Journey Map

Through reviewing this pattern, I could easily have an overview of user behaviors in a timeline-based map. Design opportunities could be defined precisely using time points. There are two advantages to utilizing this map and combining it with the experience pattern.

1. Participants' emotional reactions at different moments could be identified easily. In the experience pattern, the opportunity points were already identified. These negative time points represent certain behavior that is unpleasant for participants. However, even a single time point could affect other time points with similar attributes. To analyze the stages extends understanding and scope to the rest of the points.

2. This map organizes and cleans up unsorted information in a rational and systematic way. Through utilizing this map, a design team could easily discuss results of user experience studies and users' emotional needs. This method utilized a simple calculation to define the stage as pleasurable or unpleasant, and transformed the degree of emotion into an actual number. While calculating, only a single stage was processed at one time. Next, the numbers of pleasure and pressure were added up separately, then pleasure was deducted from pressure. If the total is a positive number, then the stage is pleasurable. On the other hand, a negative number represents pressure.

3.4.3 How Emotional Demands Help Designers

The results of categorizing UX into categories of emotional needs provided a clear indication that specific emotion demands are important during certain phases of improvement work. These key emotional demands are useful reminders while proceeding with design concept development.

Designers sometimes concentrate on design practice elaboration instead of thinking about how emotions affect users. This method could help designers to remember users' most demanding emotional needs easily, and track what experiences lay behind these emotions. Moreover, categorized UX could be utilized as basic materials for other stages of analysis.

3.4.4 Findings from the Pleasure and Pressure Diagram

After categorizing data with these principles, two diagrams of UX analysis and two diagrams of emotional needs analysis are formed. In following paragraphs, conclusions from analyzing these diagrams will be described.

Pleasure

In the UX diagram, most pleasure from the planning phase is concentrated in the Ideo-psycho quadrant, and pleasure from the working phase is concentrated in thepsycho-socio quadrant. This phenomenon could explain that while people plan an improvement project, individual considerations and personal preferences could be more significant than group considerations. On the other hand, while users proceed further with practical work, they seek out strong mental support from friends or family members. Besides these key findings, positive experiences within the planning phase are spread across the rest of the quadrants. This could indicate that there should be assistance from different perspective to help users to earn positive experiences during the planning phase.

In the emotional demands diagram, stimulation in the planning phase is the biggest group in the Ideo-Psycho quadrant. This could explain why while doing planning work, joy and a relaxing atmosphere are the major considerations. Home improvement is about modifying and renovating a place in which people feel comfortable and relaxed. Hence, it is important to experience a relaxing mood while planning instead of conflict and disappointment.

In addition, autonomy in the planning and working phases are mostly located in the Ideo-physio quadrant. This explains that people feel positive while they make decisions through personal influences, such as visiting home improvement shops to experience materials and products in person. Moreover, UX of the reflection phase mostly aligned with the psycho attribute. It could mean that enjoying a new and fresh atmosphere after home improvement could bring more mental pleasure than physical convenience.

Pressure

In the UX diagram, most pressure from the planning phase is concentrated in the Ideo-psycho quadrant, and pressure from the working phase is concentrated in the Ideo-physical quadrant. As we know from the experience pattern analysis, there are many steps in the planning phase that people have to take individually before moving to the working phase. The diagram just reflected this situation. Moreover, pressure during the working phase is coming from “dirty-hands.” People need to sacrifice their leisure time and physical power to proceed with their plan. If they do not see home improvement as a hobby, they will feel pressure from this since unappealing work will occupy the moments they would have had to relax.

In the emotional demands diagram, competence in the planning phase is the biggest group in the Ideo-Psycho quadrant. It could explain why people do not feel confident in achieving their goal. Moreover, feeling stress from lack of competence might reflect that when people face a problem, they need to look for a starting point to move forward from.

An interesting finding from the observation is that psycho pressure is much heavier than physio pressure during home improvement. It could represent that when designers generate concepts to assist home improvement, fancy technology is not helpful for users. This method could coordinate user experiences, behaviors and emotional demands perfectly. It could especially be seen as a method to conclude the findings of previous analysis.

3.4.5 Top Findings--Summary of Analysis

After dealing with the huge amount of analysis work, several conclusions were reached and defined. However, these results were still in development for design concepts. Firstly, the opportunity points and pleasure and pressure experiences on the points had to be looked into. Next, analysis of these experiences and generating top findings of user experiences had to be achieved. Only looking into opportunity points could result in loss of significant information from other time points. Therefore, the top findings will be generated from the general norms as well.

Planning Phase

1. Users need structured information of materials and products to reach a clear starting point of planning. (Competence)
2. If users are not capable of planning projects adequately, they quickly feel helpless and doubt themselves. (Competence)
3. Experience levels of users, task levels and working partners all affect methods of project planning. (Autonomy)
4. Users want to involve social network contacts in discussions in order to get reassurance on decisions in certain stages within the process. (Popularity)
5. The beginning of the project looks like a complicated and difficult puzzle, but when users proceed with the project further, they are able to complete it step-by-step. (Autonomy)
6. Users are constantly stressed when trying to reach a satisfying or ideal decision. (Security, Stimulation, Autonomy)
7. Some extra space for users to breathe within a fixed timeframe is always necessary. (Autonomy)
8. Arranging the priorities of tasks is difficult without practical experience. (Competence)

Working Phase

9. Users fear exclusion from the working process due to a lack of practical knowledge. (Competence)
10. The delegation of tasks needs to be distributed wisely between users and working partners, as well as a shared common understanding of the project. (Popularity)
11. Confronting unexpected situations during the intensive working process creates heavy mental stress. (Autonomy, Competence, Stimulation)
12. Deadlines destroy the joy. (Stimulation)
13. During the ups and downs of the working phase, users have to deal with issues regarding loss of motivation. (Autonomy)

Reflection Phase

14. Reflections could lead to new initiatives of further improvements. (Autonomy, Competence)

General Norm

15. FLEXIBILITY: Users need high levels of flexibility and tolerance throughout the entire progress in order to proceed with the project smoothly and with emotional wellbeing. (Autonomy, Stimulation)
16. VISIBLE & INVISIBLE: Invisible issues are much harder to solve compared to visible issues. (Autonomy, Competence)
17. MENTAL STRESS: Users are often not aware of the amount of invisible mental stress that they might need to face. (Competence, Stimulation)
18. It is essential to bring pleasure and enjoyment to users during the improvement activity and make them feel capable of and effective in taking actions on their own.

In order to provide clear descriptions to each result, they are being phrased as sentences instead of short topics. On the other hand, these top findings are the basis for generating design principles that will be introduced in the next section.

3.5. Design Implications

This section could be seen as the transition point between the theoretical analysis and design concept development. Methodologies of the design analysis and the results will be introduced.

3.5.1 Persona

Persona is a necessary tool for UXD practitioners to keep characteristics of their target users in mind during the entire process. Simply said, a persona is a document that describes typical target users (Unger and Chandler, 2009) as well as a particular type of conceptual model used for demarcating users by behaviors, motivations and expectations (Saffer, 2010). The content of personas is generated from the results of talking to and observing users. Depending on the requirements of the project, the level of reality could be varied. Moreover, personas could be a constant reminder of your target group. There are many books (Unger R. and Chandler C., 2009) and tutorials that demonstrate the skills of creating personas. However, there is no fixed template. First of all, a visual image of the target user group is the most important attribute of a persona. Graphics always tell a better story to the users. Styles and variables have to be defined through reviewing user study data and requirements from each project. In general, a persona should contain at least three and no more than ten attributes (Kumar, 2013). The numbers could be added or subtracted depending on the project. Furthermore, according to the target segments of project, there could be more than one persona to provide descriptions that are more detailed to distinct user groups.

As mentioned at the beginning of this chapter, three users groups were defined by type of residence and experience level of improvement activities. They are the novice, pragmatist and enthusiast. These user groups only brought about a very general way of categorizing research participants without telling further details of

their behaviors and motivations regarding the improvement plans. After completing the user studies, the participants' common life style, motivation, behaviors and insights of home improvement were recorded. According to these findings and their characteristics, three personas were created for distinct user groups. In the three personas, information of age, occupation, nationality and residential location also give a general picture of the target user's background. Furthermore, life experience, example of improvement project, personality and hobbies and preference regarding home improvement are the most important variables. These contents reflect details of users' behaviors, motivations and insights in the context of improvement activities. The information also could be integrated into analysis results, such as an experience pattern, and link the work together.

	Novice	Pragmatist	Enthusiast
Motivation	Improving atmosphere of interior design or enhancing comfort to daily life	Enforcement from external events or practical reasons, such as renovation, maintainence and malfunction	Self-motivated, without any specific reasons
Skill level	- None or very limited knowledge about tool, material, product and working methods - Cannot do any independent planning work, and always need experienced people besides	- Basic knowledge about tool, material, product and working methods - Can make rough plan and working on simple improvement projects. Usually join teamwork	- Advance knowledge about tool, material, product and working methods - Can plan independently and proceeding with individual assembly work
Working frequency	Feeling changing atmosphere, or there is something has to be improved	When improvement activity requests come	On any spare time and holiday
Previous experiences	Never join any project	Done few simple projects	Done various projects between unlike levels of difficulties

Figure3-21:
Detailed definition of user groups

Edwin

35 years old / IT manager / British

Espoo, Finland

Enthusiast

“I’m busy, but manual labor relaxes me.”

About Edwin

Edwin received his master’s degree in computer science in Helsinki. After graduating, he remained in Helsinki and married a Finnish lady. They have a 7-year-old son. Edwin lives in Espoo with his family in a small private house with a backyard. He is a football lover, and he plays every Saturday. Edwin’s father is an experienced constructor; as a result, Edwin participated in many construction projects as a teenager.

Current home improvement project: Renovating summerhouse

The family loves Finnish nature, and this year, they plan to spend four months building a lakeside cottage. Edwin will plan and work on the whole project, which includes wall painting, floor, cabinets and toilets, by himself with friends. They will stay there for at least a month every summer. The family doesn’t require fancy decoration or high technology as they wish to be as close to nature as possible.

Personality and hobbies

Edwin is an extrovert with leadership qualities, highly responsible and is positive all the time. Besides playing football, he loves nature, and is also a very good singer and guitar player.

Likes and dislikes regarding home improvement

Likes: Visiting physical shops / Discussing with family / Doing hand works

Dislikes: Long-term project too exhausting

Figure 3-22:
Persona of Enthusiast

Howard

26 years old / Salesman / Finnish

Helsinki, Finland

Pragmatist

“Creating the right mood is important”

About Howard

Howard is from East Finland, and received his bacholar degree in Marketing in Helsinki. He has worked in a packaging company since 2011. In two months, he will move to a rental apartment in Vantaa with his girlfriend. Howard’s job requires long work hours and frequent travels within Finland. Howard completed some simple home improvement projects with his parents while he lived with them.

Current home improvement project: Refurnishing the livingroom

The two major tasks of his current project are: painting the walls with new colors and assembling cabinets for home theater devices. Howard and his girlfriend are newly moved in and dislike the original color of the livingroom walls. Also, Howard just bought a B&O home theater system, and would like to put it in the middle of the living room. The couple is planning the project together. His girlfriend Ivy is a graphic designer, and she is familiar with colors. Ivy will decide the color of the walls, while Howard will be in charge of the cabinets.

Personality and hobbies

Howard is an introvert, but has good communication skills. He loves to travel, has an open mind and is constantly curious about the things around him. He is an amateur photographer who sometimes takes pictures for his friends.

Likes and dislikes regarding home improvement

Likes: Gathering information / Visualizing future scenarios / Working with friends

Dislikes: Budget planning/ Manual labor / Inconveniences during improvements

Figure 3-23:
Persona of Pragmatist

Janina

31 years old / Media Planner / Finnish

Helsinki, Finland

Novice

“Elegance is the key to my life”

About Janina

Janina was born in Helsinki and received her MBA there a year ago. She now works in an advertisement agency. She lives in a small studio in the central area of Helsinki. As a city girl, Janina knows how to dress herself: high heels and brand name clothes all the time. Because of her work, she needs to attend all kinds of parties to build up her social network.

Current home improvement project: Hanging a new lamp in the dining room

She recently bought a new lamp from Vitra Design, and plans to hang it on the ceiling of her dining room. Her old lamp was broken and has to be replaced. Changing a lamp is a difficult task for her. Janina has never done any home improvement by herself because her parents forbid her from touching tools as a child. She has to ask her boyfriend for help when he has free time.

Personality and hobby

Janina is an extrovert and a social queen. She can behave properly in any occasion and bring joy into conversations. Janina is also a fashion expert and has good tastes regarding interior design. Decorating her house and cooking are her hobbies.

Likes and dislikes regarding home improvement

Likes: Finding inspiration / Visiting physical shops / The moment of completion

Dislikes: Always needing to ask for help / Being helpless due to lack of knowledge

Figure 3-24:
Persona of Novice

3.5.2 Design Principles

Based on Kumar’s study, design principles fill the intuition gap, giving us a good structure to move from understanding needs to defining principles to explore opportunities to generating concepts (Kumar, 2013).

After defining the top findings from user research through various analysis methods, these findings became the foundation of generating the design principles. Design principles can be seen as transition points for general research data to shift to a frame that could start concept developing work. Design principles should be actual, forward-looking prescriptive statements. It should also support easy concept development (Kumar, 2013). These are the ten design principles generated from the top findings:

1. Set an organized and accessible entry point to search for practical information.
2. Have a structure of information that is a logical puzzle that even non-experts could piece together easily.
3. Provide an immediate understanding of potential outputs or ideal solutions for any actions within the process.
4. Create a common visual language for all platforms.
5. Transform invisible mental stress to visible graphics.
6. Have pleasure and enjoyment as the major emotions.
7. The interaction should make users feel capable of and effective in taking actions and making decisions.

3.5.3 Opportunity Areas

Opportunities at this level can feel very similar to “concepts”; the difference is the amount of details that you need to give. Opportunities are less detailed and concrete and only indicate possibilities as a concept space (Kumar, 2013). On the other hand, IDEO defines opportunity areas as a stepping-stone to idea generation, or a re-articulation of problems or needs in a generative, future facing way (IDEO, 2011). According to these definitions, opportunity cannot be seen as a solution, but it allows designers to explore and develop concept or solutions upon them. I followed IDEO’s working methods to explore opportunity areas. When thinking about the possibility of concepts, the sentence always starts with ”How might we...” to trigger following concepts of design opportunities.

1. Building customized improvement works that adopt distinct attributes of user groups

How might we...

- Find general starting points for different user groups
- Screen users and place them in the desired placements
- Lead users to move forward smoothly within the process

2. Removing obstacles during improvement work in order to plan and work smoothly

How might we...

- Offer access to different information points for users
- Make planning work intuitive and relaxing
- Enhance users’ motivation to move from planning to actual hands-on work

3. Making decisions together instead of taking responsibility alone to create an improvement that everyone can enjoy

How might we...

- Involve stakeholders in discussions and home environments without violating privacy
- Help users to ask for help
- Summarize users’ requirements or questions in simple but clear descriptions
- Assist users to document working process
- Summarize improvement results as reference for future work
- Encourage people who have similar demands to support each other through social networking platforms
- Provide a channel/platform for users to share their plans and experiences

4. Noticing gaps between reality and estimations to restrict levels of frustration

How might we...

- Provide solutions and assistance so that users can avoid panic
- Estimate possible gaps between ideal and actual situations

3.5.4 Ideation Workshop

After collecting all materials for developing the initial concepts of the mobile app, I facilitated an ideation workshop for brainstorming. Four students were invited, and they major in the interaction design and industrial design fields. All of them have worked on home improvement projects, but not as experts. Before introduction of the workshop, these students did not know any information of the thesis work. Besides the brainstorming session, PLEX cards were used in the initial phase of the workshop as an ice-breaker. Details of the PLEX card game and brainstorming will be described in the following two sections.

I briefly presented the background of the thesis work and analysis results at the beginning of the workshop. Afterwards, PLEX cards were utilized to let participants understand the context and scenarios of home improvement based on the introduced information. Brainstorming took place throughout these sessions.

3.5.4.1 Scenarios with Playful Experiences

While considering improving the home environment, it should not be seen as a serious and disciplined activity. Thus, UX becomes the tool that can help designers to add more emotional elements and enhance users' satisfaction. Most of the time, I talked about how to utilize UX as a major tool to devise design concepts which could satisfy and deliver pleasurable feelings in this thesis work. However, concentrating on rational approaches to utilize UX may lead designers' mindsets to ignore joy and happy emotions when we look into it too seriously. In Olssen et al.'s study, they took playfulness as a study approach to explore. In fact, playfulness can be found anywhere in our daily life. It can be an attitude that makes the activities more enjoyable. design concepts.

Furthermore, a playful approach can lead us to look things from a not so serious perspective with real world consequences (Olsson et al., 2013). Therefore, PLEX cards (Lucero A. and Arrasvuori J, 2010) could be used as a powerful tool to assist designers to explore playful experiences or fresh inspirations to refine early

PLEX is an acronym for playful experience. In Lucero and Arrasvuori's study, they mentioned that playfulness is a broader human phenomenon than playing games. Furthermore, the terms "play" and "game" refer to two intertwined, but still different things. Play may not have a clear beginning, end, and goal, and it may not even appear as a playful activity to an outside observer. Furthermore, playfulness is a state of mind rather than an action. Play can be a way of achieving new things because it allows people to look at and approach things differently (Lucero A. and Arrasvuori J, 2010). Based on the PLEX framework which they developed, PLEX cards were devised. They contain 22 categories of playful experiences that could be utilized for brainstorming and creating scenarios for the initial phase of design concept development. I utilized the scenario technique as a tool for users to have a general scope of improvement work in a short period of time.

Figure 3-25:
PLEX card workshop

Fist, I introduced two improvement activities as contexts of the scenario, which are wall painting and wooden floor renovation. Besides introducing the context of the project, their working behaviors were mentioned as bullet points as well. Next, the personas were introduced for participants to understand the target user groups of the scenario. Lastly, participants utilized PLEX cards to build a scenario of home improvement with a mobile app. Two scenarios were generated for enthusiasts and novices in the workshop. I also invited two other students who study HCI and industrial design to generate the scenario for pragmatists.

While utilizing PLEX cards to generate scenarios, the participants were split into pairs. Each pair randomly selected three PLEX Cards from the deck of 22 cards. Using an A3 template, participants created a scenario using the three cards. The scenario (or 'used story') is first triggered by an action related to the first card, then it is developed further with the second card, and it is finalized with the third card. Participants are allowed to change the order in which the cards were initially drawn, until they find a combination that helps them build a scenario (Lucero A. and Arrasvuori J, 2010). The three scenarios will be introduced in following pages.

Figure 3-26:
Introduction session of PLEX card

Enthusiast:

Beginning: Competition

Several enthusiastic guys want to compete their skill of floor building. They set up challenge goals, such as budgets, schedule planning, aesthetics, style and teamwork. One of the guys heard that the mobile app's task management function was very powerful, so they decided to use it to assist their task management during their working phase.

Continuation: Sympathy

At the end of the competition, all participants shared and exchanged working processes and achievements through the mobile app. When people looked into the working result, they can learn something that they did not know, as well as feel that one is trying to teach and share. Moreover, people become motivated by one's work.

The end: Sensation

After the hard working process and sharing of results, the people enjoy their brand new floor with feedback from all of the human senses. For instance, one can look at the work and feel aesthetic satisfaction. Furthermore, while smelling the natural fragrance and touching the surface of the new floor, they felt a connection with Mother Nature.

Figure 3-27:
Participants are generating scenarios

Pragmatist:

Beginning: Challenge

Howard is a student who is ready to move into his own flat. He wants to repaint the living room due to personal preference. It is really ugly and it should be improved, but he does not have any idea about the materials.

Continuation: Suffering

Howard does not know which color to choose and there are too many colors in the shop. He has no knowledge of paints. He also feels frustrated when looking for information about proper tools to use in the process. He always feels there could be something missing. For instance, he might paint the wrong colors and makes the room dirty, and he will be angry about it.

The end: Expression

Through talking to friends and family, he was recommended to use the mobile app. He found some communities and sent open requests to consult about painting. Through the mobile app's assistance, fear and frustration left him, and he was inspired by the answers from the community members. In the end, he came up with a creative idea. Finally, he painted a world map and included every location he has been to so far, and will visit soon. Afterwards, he was very happy and shared this concept through the mobile app.

Figure 3-28:
Reviewing and sharing scenarios of different target user groups

Novice:

Beginning: Discovery

Janina wanted to paint her bedroom walls with patterns and stylish colors. She needed to find information about the whole process, especially materials she needs and special techniques for painting. She is curious, motivated and wants to learn something new. She randomly found this mobile app in the App store, and decided to give it a try. She used the template for painting project management in loop, and got all the materials and tools through its suggestions.

Continuation: Humor

While painting the wall, Janina recognized the color she picked is wrong! She mixed the color with some water, but it was not enough, so she had to mix it again. However, she even made a mistake when measuring out the portion. It was too late to do anything. Now, she has two different colors on the wall. Her friends come along and laugh with her about the surprising conclusion, which is that she likes the color mixtures a lot.

The end: Expression

Janina took a photo of her new painted wall and published it in an online community through loop. Surprisingly, the picture received a lot of likes and shares, and the wall got quite popular! It eventually became a new way of wall painting that everyone wanted to do. Janina now thinks that she indeed is very talented and wants to start her own painting and color business, thanks to the mobile app for her initial paintwork!

The results of generating scenarios with PLEX cards in distinct user groups that display the possibility of improving concepts with playful experiences show that even some negative experiences were utilized. Moreover, people who own skills and can work independently or be leaders in complex improvement projects could handle higher mental pressures and less playful moods. On the other hand, people who do not have advanced knowledge and skills for home improvement could need more fun and inspiring moments during improvement.

Figure 3-29:
PLEX scenario of Novice

3.5.4.2 Ideation Session and Primary Concepts

Through the PLEX cards session, the participants had a rough but much clearer scenario of how the mobile app could assist home improvement activities. In this session, categories of opportunity areas were the basis of brainstorming. According to the descriptions of each opportunity area, many inspiring concepts for features of the mobile app were generated during this ideation session. However, these ideas still needed to be filtered. Therefore, an opportunity mind map was used as the major method of categorization (Kumar, 2013). This method provided a nice visual expression that allowed the designer to understand the results of the ideation and possible further exploration and concept development.

In order for the map to be able to generate more design concepts and fit requirements from the collaboration company, only the categories of the major features were displayed instead of a detailed description.

Figure 3-30:
Genrating ideas from conclusions of opportunity areas

Figure 3-31:
Opportunity mind map of ideation session

3.6 Personality of the mobile app

Through focusing research on UX and relevant fields such as human-computer interactions (hereafter referred as HCI) and usability engineering within the thesis work, “loop” will be the outcome of demonstrating the result of studying related fields. “loop” is a mobile application that aims to assist users through intuitive interactions and structured information in uncomplicated frameworks in order to reduce the complexities in planning and working. Moreover, “loop” could be seen as a stepping stone for people who are eager to explore the possibilities of home improvement activities, and give them an easy and relaxing staring point.

Without explanation, it could be hard to imagine the meaning of the name “loop.” Through analyzing and studies of home improvement, I realized that home improvement activities never have a clear end. It does not mean that a project will not be finished, but people should see improving one’s residence as a life long event. As long as we are still breathing, people will not stop having the desire to make their households better and raise the quality of life. According to this phenomenon, I generated several names to illustrate the mobile app which could provide assistance to the process of home improvement. Eventually, “loop” was selected as the name for the mobile app as the name could represent the following meanings:

1. Home improvement is a life long event, and it will repeat unlimited times until you stop breathing. “loop” contains the meaning of unlimited cycles, and it perfectly meets the phenomenon of home improvement.
2. “loop” means a closed or partly open circle, and this description illustrates and fits into the process of home improvement.
3. Since “loop” could be seen as a partly open circle, people could also involve their social networks and family while the improvement is taking place.
4. It is a one-syllable word, easy for users to remember and recommend to their friends.

What will you think about when people mention about the term “personality”? The dictionary, defines it as the set of emotional qualities, ways of behaving, etc., that makes a person different from other people” (Merriam-Webster, 2014). For example, we become friends with certain people because of their unique and attractive characteristics and personalities. It might be hard to find precise words to describe why you like them, but you just cannot help that you would like to share your stories with them and make them become part of your life. The same understanding can be applied to the mobile apps that we use on a daily basis. While we operate these interfaces, it would be great to feel that there are real people behind the screen. In other words, a personality could be seen as the platform for emotional communications between users and the interface. In Walter’s study (Walter, 2011), he mentioned that emotional design’s primary goal is to facilitate human-to-human communication. If we cannot communicate with users, how could we satisfy their emotional needs? In this section, the emotional relationship between loop and potential users instead of its features are discussed.

Under the context of home improvement, users are overwhelmed with the various kinds of pressures from different perspectives. According to results of user studies, the popular companion that participants desire for is a group of friends. Friends could provide actual physical help when you really need more hands to help you to complete the work, but even if they cannot provide practical assistance, these friends can still reduce your mental stress, such as frustration and anxiety through talking or just being there.

It sounds like creating a friendly personality for the interface could be a very beneficial idea for loop, but as mentioned above, it is not easy to describe it precisely as a person’s personality in a few words. In the previous sections, a persona was utilized to simulate target user groups’ behaviors, motivations and expectations. If loop is a person or an assistant who can communicate and interact with users during improvement activities, what would its behaviors and characteristics look like? Creating a design persona for loop might be helpful in finding the answers.

Based on Walter’s work, a design persona is similar to personas that we use to illustrate target groups. It should include the brand or product name, an overview, a personality image, traits, a personality map, voice, copy example, visual lexicon and engagement methods (Walter, 2011). The following is loop’s design persona.

Overview:

“loop” is the name for the collaboration company’s mobile app for assisting home improvement for users using its products. “loop” is a guy around 30 or 40 years old, experienced in all kinds of home improvement projects. He also has nice aesthetic and interior design tastes. With his broad knowledge, he could give you many inspirations. “loop” supports users whenever they need it. It knows users’ life styles and living habits quite well, so it can provide suggestions that users can really utilize in their projects. Moreover, users never feel frustrated when they interact with loop because it offers funny and informal experiences, as well as trustworthy assistance.

loop’s personality image:

As mentioned, the personality of loop should contain friendly feeling. Moreover, while people receiving assistance from loop, trustworthy and reliable is necessary for users to experience. Based on these emotional feelings, loop’s personality image is created.

Figure 3-32:
Image of loop’s personality

Traits:

Supportive without slow reactions. Witty, but not spoofing. Easy going, but not boring. Reliable, but not complicated. Casual, but not blase.

Voice:

loop speaks gently, and the voice is warm and full of energy. Users can feel that the personality behind the screen is reliable and honest. It never talks like a nerdy engineer or old school carpenter, but tells stories and jokes like an acquaintance. Informal grammar is used in the conversation between user and loop, such as “blah”, “oops”, “mmmmmm” and “oh oh”.

Personality Map (Walter, 2011).:

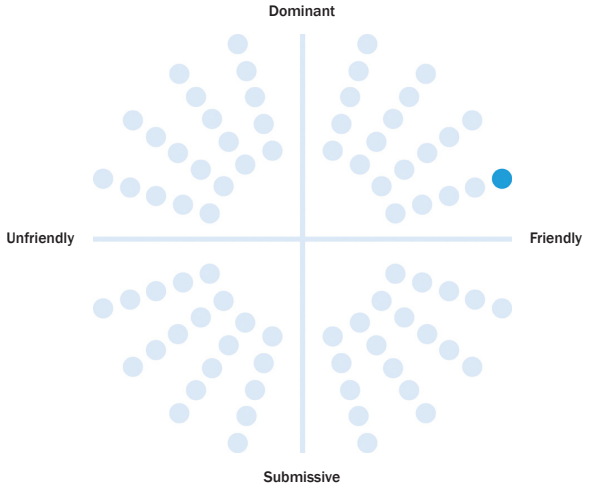


Figure 3-33:
Personality map of loop

Example:

When users achieve their goal: “Oh man, you made it!”

Error message: “Uh oh, looks like you need to put an email here.”

Service failure: “Hey, sorry to bring you this inconvenience, will bring you back into loop soon.”

Visual Lexicon:

Color: Blue based color palette. It should be light, clean and evoke calm. It should bring a powerful impact to viewers, and make them feel that improvement work is not stressful.

Layout: It should look like a notepad in the real world, contain shadows on the different layers of pages. A flat design is a necessary element.

Typography: Sans-serif will be used as the major font. It reflects an easy-going feeling and sufficiency of usage.

Engagement Methods:

Manipulating and rational: While choosing from the function list, users can decide which functions to use at different points in the project. loop will provide suggestions for suitable options.

Simple and easygoing: If users want to document their shopping or working process for the first time, loop can provide easy and simple instructions to help users use the function.

A design persona could also be seen as a tool that reminds designers to not only concentrate on the theoretical finding of the UX and the emotional needs with high-level descriptions, but also a relationship that can be built with target users. It could be a guideline that leads teams to also reflect on the design process. Moreover, a design persona transforms core emotional needs (autonomy, competence and stimulation) from general descriptions into tangible design guidelines that designers could follow during the process.

3.7 A Heuristic Evaluation of Competitors

While talking about UX, usability is not a topic that can be excluded. In this section, Nielsen's work of using usability heuristics (Nielsen, 1995) to analysis the usability of existing mobile apps in home improvement is discussed. There are many mobile apps on the market that provide various assistance services, such as paint color simulations. However, most apps focus on developing technical effects and functionalities instead of providing specific and suitable solutions for users to utilize during improvement work. According to the phenomenon, usability studies of existing products is a significant action before starting design work for loop, and it is beneficial to understand the competitors' situations as well as prevent inefficient usability issues from being found in loop.

According to Nielsen's definition, usability heuristics could be seen as usability guidelines for designers and developers to follow while designing the interface. He summarized ten basic usability principles from thousands of rules, and developed a method to evaluate interface usability, which is the "heuristic evaluation." It is done by looking at an interface and trying to come up with an opinion of what is good and bad about the interface (Nielsen, 1993). Following this method, I evaluated two mobile apps recently popular on the market: Home Styler and Magic Plan. The former is utilized for the simulation of interior design scenarios, and the latter is utilized for making blueprints of the house. In other words, although they are both designed for home improvement, they have distinct approaches. Three heuristics were chosen as major heuristics to proceed with the analysis.

1. Aesthetic and minimalist designs (Simple and natural dialogue)
2. A Match between the system and the real world (Speak the users' language)
3. Recognition rather than recall (Minimize users' memory load)

(Nielsen, 1993 and 1995)

For the conderations below, these three heuristics are chosen.

First, communication between users and the mobile apps under the context of improvement work is the most important perspective. As mentioned in previous sections, experiences are hugely affected by human emotions. The initial step that people take to build their relationships and emotions to any objective is to go through communication. Home improvement is an activity in which people are involved with the place where they embed complicated emotional needs. To fit the place into an ideal situation, the apps should provide smooth communication in order to understand users' needs.

Second, reducing memory load for people who work on improvement activities will be a beneficial perspective. During home improvement activities, users are already busy arranging their physical work and facing an enormous amount of mental stress. Once the apps increase their memory load instead of decreasing them, users might give up using the app.

Aesthetic and minimalist designs (Simple and natural dialogue)

Definition of this heuristic is that dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility. In this heuristic, graphic design and color, information content of screens and choices of features are included.

Home Styler:

- The interface is very simple and clean. Dynamic colors and an intuitive layout provide convenience when operating
- The content of system information is clear and simple
- A start page with simple options provides convenience of app launch.
- Very detailed categories but tiny icons increase difficulties of readability

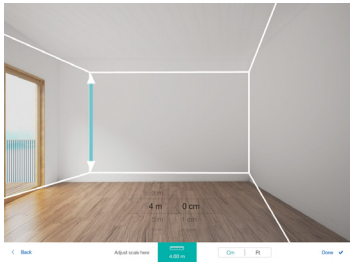


Figure 3-34:
Dimension measurement feature of Home Styler

Magic Plan:

- Incoherent color combination and a dark interface decrease readability
- Complicated operation description discourages users from proceeding further
- A clear and large clicking space for each category
- The measurement tool is not easily seen

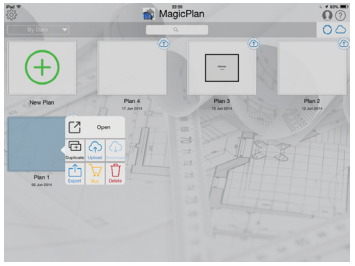


Figure 3-35:
Project organizing feature of Magic Plan

Match between the system and the real world (Speak the users' language)

The definition of this heuristic is that the system should speak the users' language, with words, phrases and concepts familiar to the user, rather than the use of system-oriented terms. The system should follow real-world conventions and make information appear in a natural and logical order. In this heuristic, the meaning of the language from users' perspectives, symbols and the way of describing situations will be examined.

Home Styler:

- Using informal vocabulary to communicate
- Using graphics to indicate usage
- Clear and simple tab descriptions
- The language is formal, not easy to understand
- Some symbols of icons are confusing

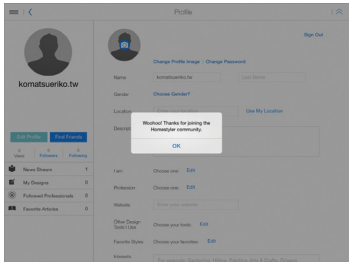


Figure 3-36:
Personal profile setting feature of Home Styler

Magic Plan:

- Descriptions of operational steps are short and clear, but do not show if the user is doing the right action
- Meaning of icon does not match anticipation

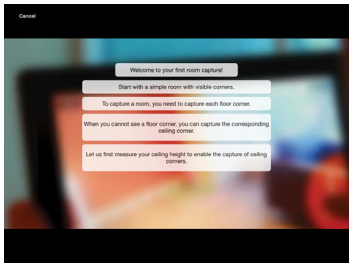


Figure 3-37:
Tutorial of utilizing features of Magic Plan

Recognition rather than recall (Minimize users' memory load)

The definition of this heuristic is to minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate. Menu design and visibility of the object of interest to the user are examined in this heuristic.

Home Styler:

- While choosing a product, users need to remember what they viewed without putting them onto the blueprint.
- Need to remember the information structure of the app. Menu is not helpful.
- Need to spend a lot of time to understand the menu structure.

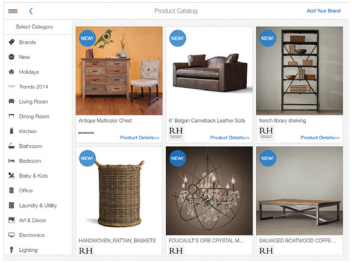


Figure 3-38:
Product selection feature of Home Styler

Magic Plan:

- Unclear layout organization of menu and working areas decrease efficiency of work.
- While building a new blueprint, users need to go through many layers.
- Menu design is intuitive.

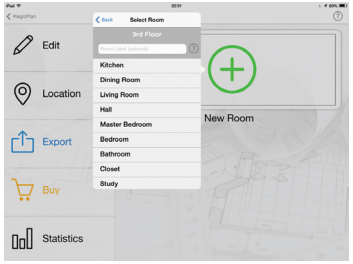


Figure 3-39:
Blueprint drawing feature of Magic Plan

After analyzing the mobile apps using the heuristic evaluation, these results could be referenced while proceeding with loop's interface design.

Moreover, the heuristic evaluation also could be used with non-experts. In Nielsen's study (Nielsen, 1993), it was done by people with knowledge about computers in general but without special usability expertise. Before proceeding with the evaluation session by myself, I invited four design students who are not usability experts to a small workshop, and did a group session of heuristic evaluation. The results of the workshop provided some inspirations of how to analyze the interface further and collect user inputs about usability in the early stages of design concept development.

Figure 3-40
Group heuristic evaluation session

3.8 The Value Proposition of loop

This section introduces the value propositions of loop, and it could be seen as the transition point from the conclusions of the research and analysis work to the actual design. This theory originated from Geoffery A. Moore's marketing book (Moore, 1991), and he created a formula to create a statement in two sentences so that your product would be worthy enough for consumers. Kumar (Kumar, 2013) transformed it into a design methodology that evaluates if your target users would like your products or not. Here is the formula:

- *For (target customer)*
- *who (statement of the need or opportunity),*
- *the (product/service name) is a (product/service category)*
- *that (statement of benefit).*

In this thesis, the target customers are the three user groups and a mixture of them. The top findings are the needs of the users. The product and the service categories could be seen as features of loop. The statement of benefit is the way that loop supports and assists users.

Figure 3-41
Progress of generating value proposition

All users:

For people who want to get assurance of their decisions on materials and products, loop provides features of information sharing and exchange so that users could transfer data and discuss on social networks with intuitive interactions.

Enthusiasts:

For enthusiasts who want to delegate tasks and share common understandings of the project with working partners, loop provides features of a task manager and a measurement toolset so that users could improve the efficiency of working through intuitive interactions and have immediate understanding between co-workers.

Pragmatists:

For pragmatists who need to combine pieces of information systematically to complete the project, loop provides features of frameworks of project planning and documenting so that users will not only enhance the environment, but also empower themselves from doing their own planning.

Novices:

For novices who fear exclusion from the process due to a lack of knowledge of practical work, loop has features of step-by-step tutorials so that users feel confident and comfortable enough to start work on basic things with instructions.

These propositions could be constant reminders of user benefits while designing the interface of loop. Once design of the interface begins, due to concentrating too much on feature development, visual design and interaction design, forgetting users' benefits might occur.

4/5 Design Concept Development

> ***Less is more.***
>
> *- Ludwig Mies van der Rohe, German architect*

Based on the findings and analysis results from previous chapters, a tangible design concept of Loop and its design process will be introduced in this chapter. Several initial ideas were generated in Chapter Three, but it is still not clear how to transform them into tangible designs that users can utilize efficiently and earn assistance from during home improvement activities. Due to limitations when applying interaction and visual design concepts to mobile apps, creating an informative architecture for loop could support further design realizations without messy and confusing information structures. Based on this structure, the wireframe and low-fidelity (hereafter referred to as Lo-Fi) prototypes were built. They are used for evaluating usability, functionality and layout designs. According to evaluation results of prototype tests, a high-fidelity (hereafter referred to as Hi-Fi) interface design will be generated to demonstrate the visual design concept of loop.

4.1 Designing for Mobiles

Nowadays, our world is full of various kinds of mobile devices, such as smartphones, tablets and many kinds of wearable devices. Through innovative inventions, users have more access to information from the Internet in remote locations. These interactive products bring convenience into people's daily lives, but require designers to think about mobile designs from perspectives different to traditional ways. For instance, people do not only use these devices to browse information on the Internet, but also utilize mobile apps to assist their daily routines and improve the quality of life. However, the limitations of the hardware specifications of mobile devices restrict the information displayed, and affect the behaviors of the users that interact with the devices.

For many decades, users have already become used to sitting in front of big screens, using keyboards and mice to search for information on the Internet. However, designing an app or a platform for mobile devices is another thing. Designers have to presume that users will utilize it anywhere and in any context. In Tidwell's study, several challenges of mobile design are mentioned: tiny screen sizes, variable screen widths, touch screens, difficulty of typing text, challenging physical environment and social influences and limited attention (Tidwell, 2011). Within these challenges, the tiny screen size and physical challenges will most affect loop's design. These two factors could be seen as the major considerations while proceeding with the interactive design and layout design of loop.

As mentioned in previous chapters, loop is designed to assist home improvement activities and aims to connect to users' positive emotional elements. However, users will not stay at a certain location and sit there, just browsing information on the app. They will move around and interact with it while they are doing planning and working on improvements. In other words, users will operate the app within various physical environments.

Thus, optimizing interaction and information designs for loop becomes key tasks. While users are working with tools in their hands during improvement work, reducing memory loads and inconveniences during interaction could be helpful for users to derive better assistance from loop.

Furthermore, the tiny screen size of mobile devices is another challenge for the design of loop. One feature in loop is the dimension measurement, and users can utilize it to measure and record proportions of the working target. However, a small screen is affects operations as well as visibility of the overview of the measuring results. Moreover, small screens could be obstacles in reading big volumes of information. Due to this size limitation, usually texts of content are tiny and hard to read. It is a significant issue, especially for people who are in the progress of an improvement activity.

4.2 Features of loop

There were many design ideas generated from the ideation workshop. Nevertheless, organizing and providing essential and useful ones to users efficiently and logically is a great challenge. Although these ideas have been categorized into four opportunity areas in the last chapter, they still lack abstract contexts. In order to filter suitable features to solve home improvement dilemmas, I referred to the experience journey map for defining emotional needs and value propositions, and selected ideas that could assist users at opportunity points. These selected ideas could be seen as potential design features for LOOP. These features are summarized into general categories with common attributes, and the basic feature categories of LOOP were formulated:

1. Documentary
2. Shopping assistant
3. Material and product guideline
4. Process management
5. Database
6. Information sharing
7. Task management
8. Project planning template
9. Reference
10. Tutorial
11. Measurement tool

Definitely, all of the above categories are significant in assisting users to proceed with home improvement activities efficiently. However, developing an entire list will be a huge amount of work, and impossible to proceed within a short period. In order to verify analysis results, which include emotional demands, value propositions of distinct user groups and pleasure and pressure diagrams, four key categories were chosen for further wireframe and prototype development in order to evaluate the primary design concept in a visual way.

1. Process management
2. Information sharing
3. Documentary
4. Project planning frameworks

These “solutions” could cover major issues and negative experiences that most participants reflected upon during the interviews and observations, as well as generally shape users’ experiences and emotions.

Process Management:
Within the entire improvement process, to keep moving forward without feeling lost and panicked is not easy for anybody, especially during the planning phase of the journey, when many actions have to be taken in order to achieve further steps. This feature will help people to review the entire process of their projects, and let them know their current situation. It is similar to how a map helps users navigate in an “improvement puzzle.”

Information Sharing

A home improvement activity is teamwork, and it is rare for people to achieve the goal and complete an entire project alone. Once you work with other people, sharing and exchanging information becomes necessary. It is not only about exchanging opinions and confirming information, but also about letting everyone be on the same page to see the process. Moreover, most of the people will make decisions together, as well as involve people in your social networks and family members in discussions. This feature provides a platform for people who would like to exchange and share discussions. Furthermore, immediate information sharing is made possible.

Documentary

While people proceed with home improvement activities, they tend to collect as many touchable or intangible materials or examples as they can. For instance, color tickets of paint, samples of wood panels and pictures of beautiful furniture, etc. However, most people do not organize information in the proper order or utilize them efficiently. They even cannot find the collected information after a period of time. The documentary feature helps people to categorize and document inspirations and information in a certain format. Users can easily find what they need through certain organizing methods.

Project Planning Frameworks

For people who do not have plenty of experiences in home improvement activities, planning a project from scratch is complicated and difficult. Many procedures and steps need to be considered and completed. This circumstance also decreases motivation to progress with the improvement activity. This feature provides users with basic templates of several common improvement activities, such as wall painting, furniture assemblies and exterior renovations. Moreover, users can customize these templates and create unique project plans which fit their own lifestyles and renovation preferences.

As mentioned above, the basic categories are defined and each one contains several specified features. Referring to the opportunity points in the experience journey map, some effective features were selected that belong to the four key categories as major concepts to develop in wireframe designs. LOOP does not only include key features, but also contains features from other categories that are also effective and fruitful in assisting users to reach their goals. In order to organize and provide a clear overview of LOOP's structure, the information architecture will be established in the following section.

4.3 Information Architecture

When interactive products shape users' experiences, how do designers structure interactive products? Information architecture is the method followed. It is not easy to transform abstract analysis results and potential concepts to concrete elements with which users could determine their experiences. Therefore, defining the information architecture for LOOP becomes a significant step in the concept transforming progress. Besides, the architecture diagram and task flow are introduced as components used for the structuring of the entire information architecture.

In Garrett's study, information architecture is concerned with how people cognitively process information, and it deals with the options involved in conveying information to a user (Garrett, 2011). In other words, information architecture could structure and organize schemes which allow users to move through contents of interactive products efficiently and effectively. However, some people think interaction design and information architecture have the same approach, but they are actually different. Interaction design is concerned with describing possible user behavior and defining how the system will accommodate and respond to that behavior. In traditional software development concepts, interaction design is recognized as the major method used to structure user experiences. Nevertheless, information architecture could be seen as a separate discussion topic from building the structure of interaction design. Interaction design and information architecture share an emphasis on defining patterns and sequences in which options will be presented to users. In addition, interaction design focuses on options that involve performing and completing the task, and information architecture deals with options involved in conveying information to users (Garrett, 2011). Through reviewing these definitions, information architecture could help designers understand the logic of loop among the different features of the application, and interaction design could be built on the results of the information architecture.

In Spencer's study, an information architecture pattern is a common solution to a design problem that crops repeatedly (Spencer, 2010). She organized these patterns into four simple patterns: hierarchy, database, hypertext and linear, as well as three mixtures of combinations from the four categories: simple hierarchy and simple database, catalog, hub and spoke. These patterns have distinct and unique specifics and functionality, and usually apply to different usages and contexts. However, individual patterns can be combined together, and used for certain circumstances. With complexity and types of information in mind, loop uses the combination of simple hierarchy and simple database as a basis to develop its information architecture. This mode fits the different sizes of each site, creates hierarchical sections of the app for basic content, and then uses the power of a database to assemble detailed information within a section (Spencer, 2010). At the request of the collaboration company, loop is required to provide a total solution in the assistance of home improvement. Therefore, it contains many features that belong to different attributes and functionalities. Under these circumstances, this combined pattern provides a suitable structure for the organization of these features. Furthermore, analysis results of the experience journey map and opportunity areas are utilized as principles to narrow down the massive volume of potential concepts to several fixed sections.

Moreover, task flows identify paths or processes that users take as they progress through the websites or applications. Task flows interpret the content in diagrams visually, and they might look very similar to architecture diagrams. However, architecture diagrams provide the overview of a website or an application's structure. Task flows focus on users' options and the paths they might take (Unger and Chandler, 2009).

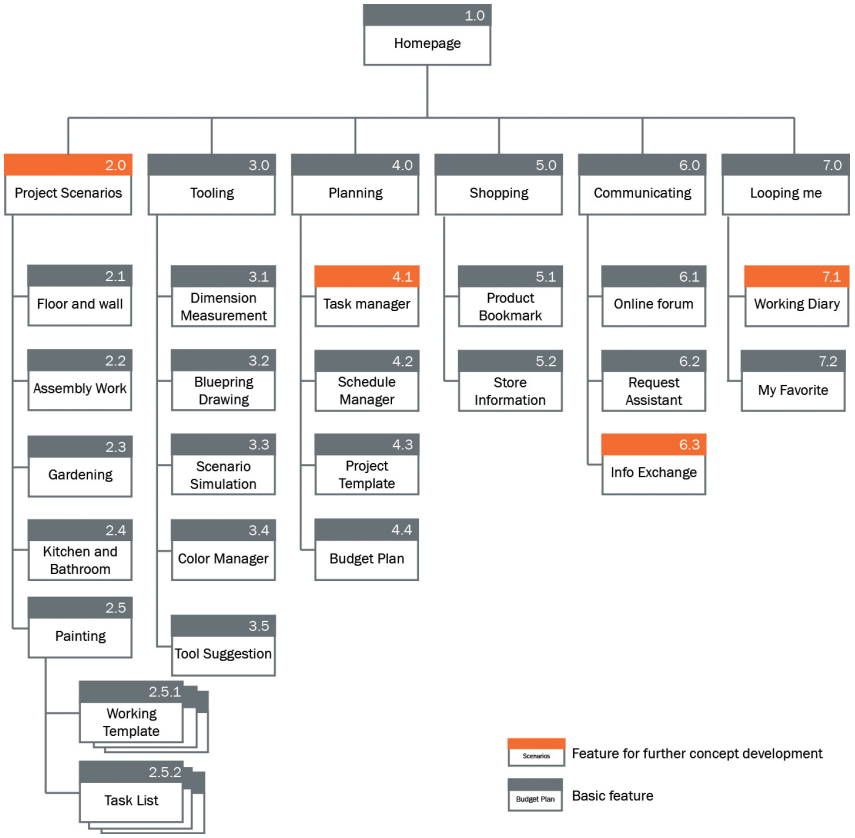


Figure 4-1:
Genereal architecture diagram of loop

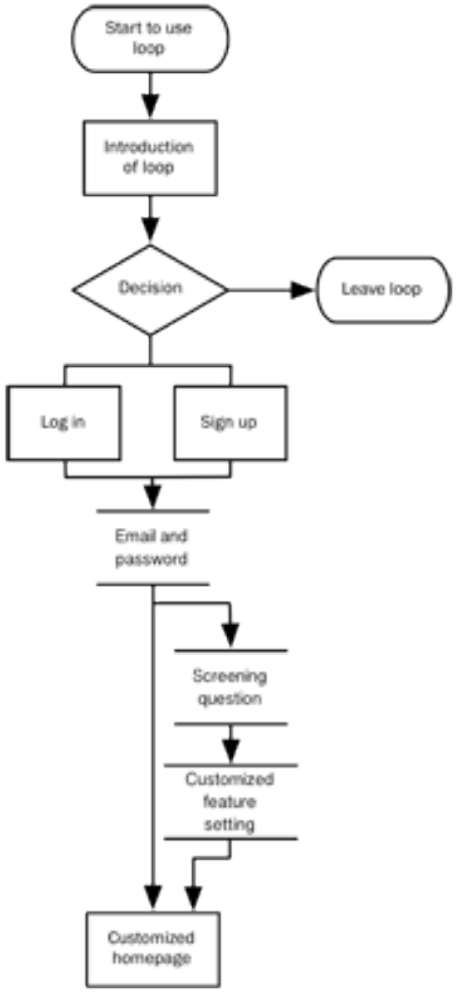


Figure 4-2:
Task flow of log in and sign in process

4.4 Wireframes

A wireframe is used to identify the elements that will be displayed on the page or screen, such as the navigation, content section, imagery and/or media needs, form elements and calls to action (Unger and Chandler, 2009). Usually, wireframes contain three major areas: the wireframe, annotations and metadata. The wireframe itself is a simple and grey scale drawing, using placeholders to replay images, and does not use specific fonts. A wireframe can show anything from the overview of an interactive product (Saffer, 2010). Annotations are brief notes that describe nonobvious items on the wireframe. They help to explain functionalities of wireframes while designers are not here. Metadata introduce information about the wireframe, such as the designer's name, version number and unresolved issues. The wireframe could demonstrate the designers and developers' "design thinking" before visual designs and interaction designs are developed. Furthermore, it is useful for the identification of prototype scenarios and proof of contents. Through displaying wireframes to users and collecting their feedback, elements of wireframes can verify if the concept is effective or not.

Through reviewing the list of features, I transformed the key features' concepts to wireframe drawings. There are analogue (paper) and digital (InDesign, Illustrator and Balsamiq, etc.) tools that can be used to create drawings. To create a quick visual concept, I use paper to create drafts of the wireframe drawing. Paper drawings are flexible, and they can transform concepts to visual material simply and efficiently. Moreover, once there are mistakes or revising suggestions from users during discussions, the content can be revised easily without a troublesome updating process.

While drawing paper drafts, I already received several suggestions from the collaboration company. Based on the paper drafts and comments, I used Balsamiq to build wireframes to simulate what the interfaces would look like in reality (Figure). In order to build an interface and structure that could really support and assist users as well as reflect analysis results, the building of digital wireframes, the experience journey map, design principles and top findings became significant references. Besides combining results from the architecture diagram and task flow, the interface design should follow the structure without losing direction. These digital wireframes became the foundation for Lo-Fi prototyping.

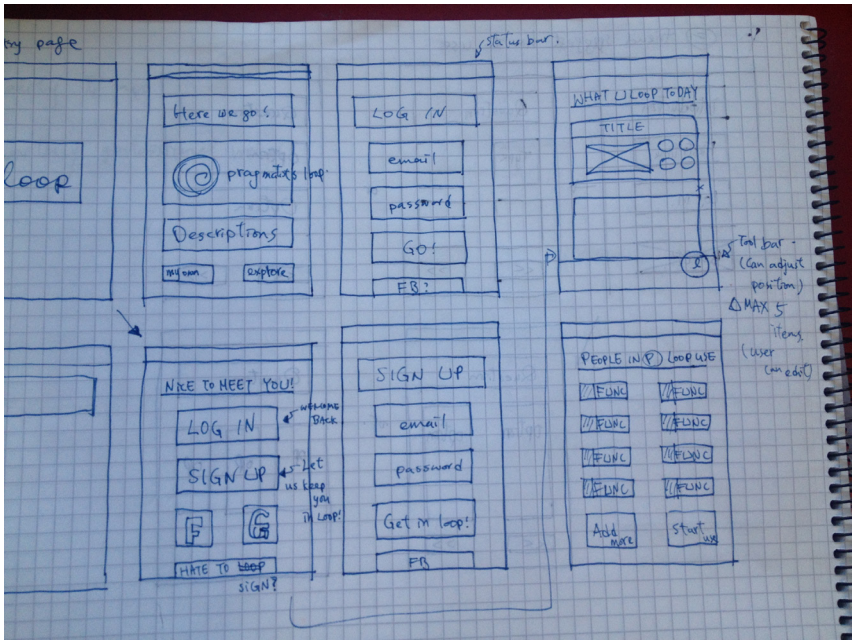


Figure 4-3:
Paper drawing of wireframes

4.5 Lo-Fi Prototype

In the context of UXD, prototyping is the act of creating and testing all the functionalities of an interactive product. Prototypes can be made with analogue (paper) or digital (software) tools as mentioned above, and they can all evaluate users' experiences. Wireframes actually could be seen as part of the prototype, but not the entire story. The prototyping process is an actionable feedback from the concept that can be used to enhance and improve the design (Unger and Chandler, 2009). Therefore, a paper wireframe is the basis of the prototype, and Balsamiq transforms the analogue content to a digital format with interactive effects. Balsamiq is used to create visual wireframes, and Axure is used to create interactive design effects.

In order to simulate actual user contexts and evaluate how interaction design would affect users' experiences, an interactive prototype is necessary for user evaluation. It also makes it possible to explore the possibilities of developing new interaction concepts. However, due to time limitations, only a few key features will be integrated to this prototype. In the following paragraphs, a sign-up process, home screen and four key features of the planning will be introduced.

When users launch loop for the first time, the system will not directly ask users to sign up or log in, but give them a short introduction that explains benefit, using examples (figure 4-4). This function could attract users to understand positive experiences and the assistance features that loop could bring for them in the future. Moreover, it provides the freedom that allows users to choose to use the app or not. The idea behind this function originally came from participant reflections of the heuristic evaluation workshop. They mentioned that signing up blindly for a certain app made them feel like their privacy was violated. Through understanding the app bit by bit, users are able to feel more secure and form emotional attachment with loop from the beginning.

Working diary

Working diaries can assist users to document their findings, inspirations and concepts during home improvement activities. This is a picture-based feature, and users do not need to insert long texts, only comments for the picture. When users create new entries in the diary, besides entering the traditional date and title, they can choose to enter a hashtag to create personalized categories for entries. In other words, users can search entries using three categories: date, title and hashtag. Creating customized categories provides users more freedom to utilize and organize data (figure 4-5).

Task manager

As mentioned in previous sections, home improvement is teamwork. How to balance workloads and task sharing with your working partner becomes very hard to achieve. This feature could help users organize their own tasks for each improvement project, but also check other people's task lists to prevent working on the same thing at the same time. Therefore, users could feel connected with working partners through this feature (figure 4-6).

Info exchange

This feature provides information sharing functions. Users can choose information from six categories, and share them through social networks. Besides this method, user can also exchange existing information using the swiping function (figure 4-7).

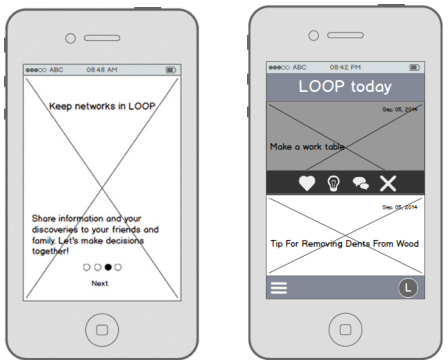


Figure 4-4:
introduction page and homepage of loop

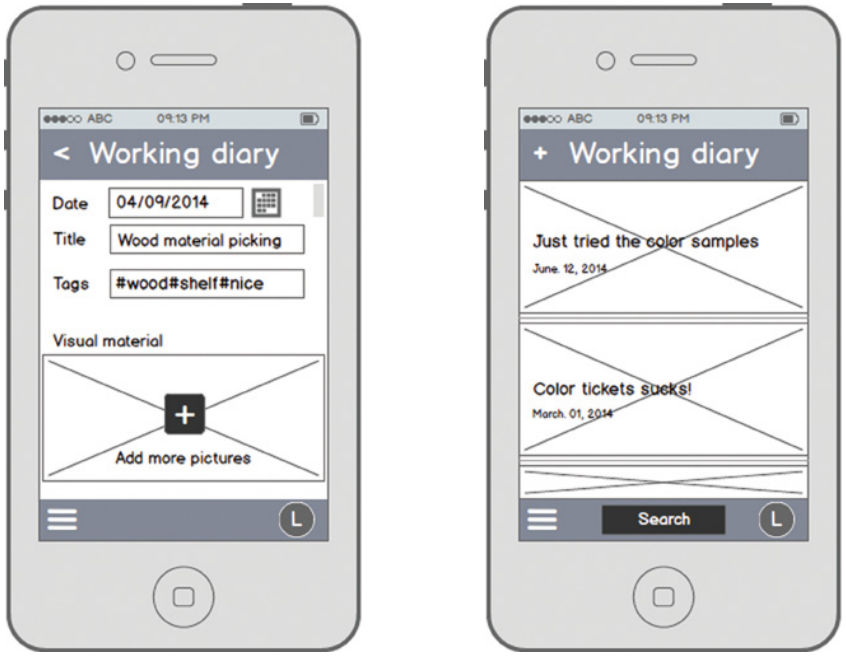


Figure 4-5:
Working diary feature of loop.

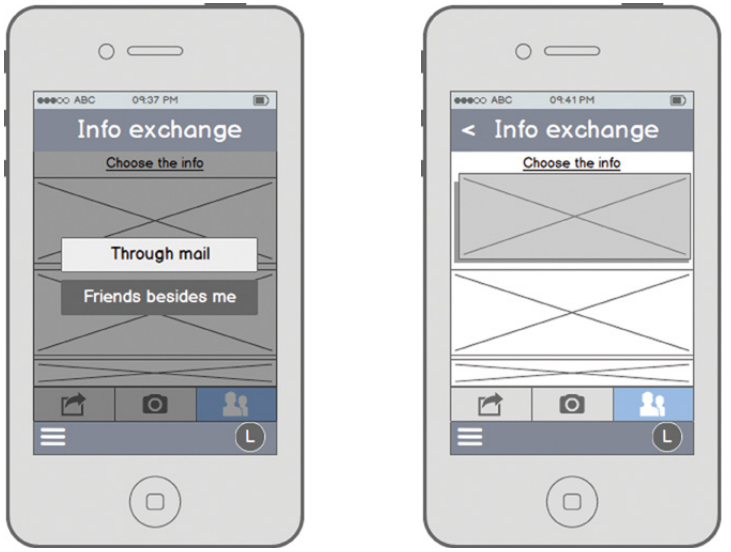


Figure 4-6:
Information exchange with other loop users

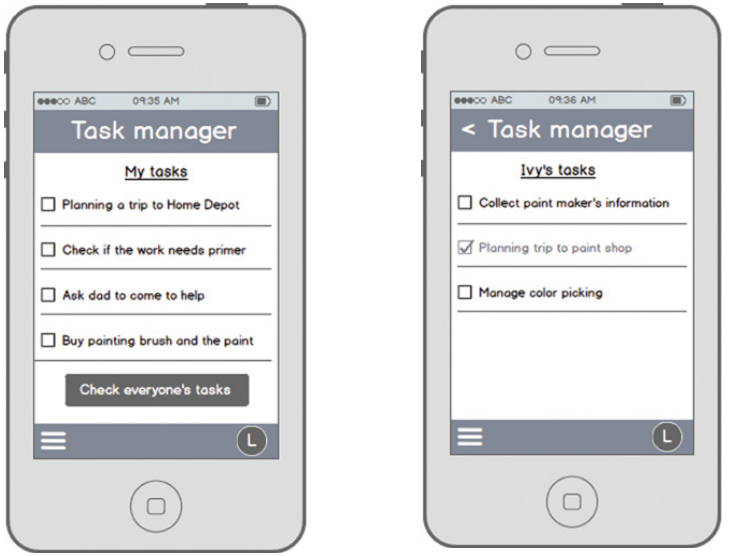


Figure 4-7:
Task manager feature of loop

Project template

For people who do not have abundant improvement work experience, proceeding with a new project from scratch is not an easy piece of work. Within this feature, six commonly used home improvement categories are listed. Each category includes two features: project templates and task list. Each different category has its unique templates that users could access and learn from the basic steps. If users are not experienced with activities within these topics, they can choose a template as the foundation of their own project, and revise the content afterwards (figure4-8). Through choosing different demands in the template settings, LOOP provides more than a single template for all scenarios. Apart from the template, the task list is helpful in assisting users to create a basic to-do list for certain home improvement projects. The list is generated from the setting that users choose within template settings. This feature could help users manage to-do lists instead of leaving a blank notepad for users to fill out with many steps.

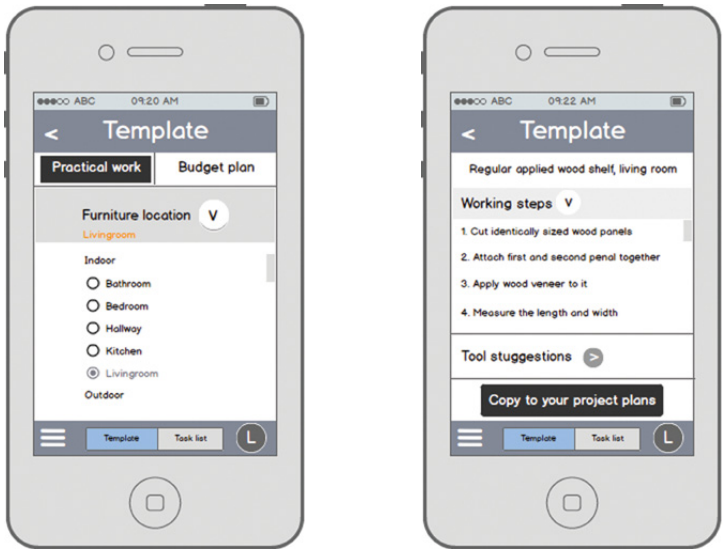


Figure 4-8:
Project template feature of loop

4.6 Expert Evaluation

As mentioned above, this Lo-Fi prototype aims to evaluate experiences, usability and emotional demands. In order to get professional comments on basic wireframes for design improvement, I invited two user researchers and two interface designers to participate in the evaluation session. Anticipated eXperience Evaluation (hereafter referred to AXE) was utilized as the major method within this evaluation session. AXE is a qualitative method that gives an initial perspective on the user experience for a product or service. It is a method that involves singular users in an interview setting. The method builds on using visual stimuli to make evaluation participants imagine a situation and reveal their attitudes, practices and valuations (Gegner, L. and Runonen, M, 2012). Through the evaluation with AXE, I did not only receive results of the required evaluating items, but also suggestions from different perspective to improve the concept development. Participants will receive a certain task that they are going to follow and evaluate their experiences when utilizing loop

1. First time user of loop
2. Try to set up customized features
3. Planning to build a shelf made by processed wood for their living room
4. Try to record the working progress with loop

Participants could state their opinions of individual features during the evaluation. After completing tasks, participants filled out the questionnaire, and provided general reflections on and experiences of using loop.

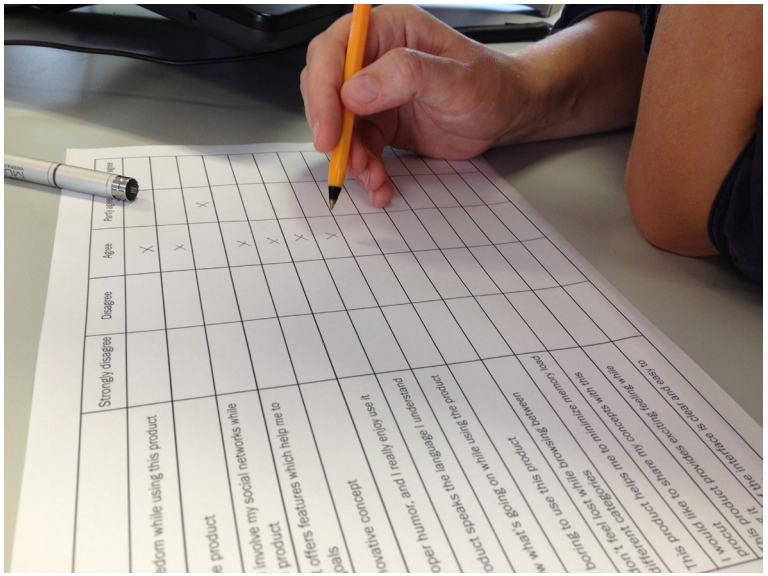


Figure 4-9:
AXE evaluation process of loop

Results of the evaluation can be separated to two parts: general feedback and questionnaire answers. General feedback include user suggestions for interface design improvements and positive and negative experiences while evaluating loop. The questionnaire helped to collect users' feedback for emotional demands and usability heuristics in a quantitative way. loop's design concept development is based on the results of research and analysis. Therefore, it is significant that the concept reflects the results and verify whether these results could support and be effective to the concepts. As mentioned above, usability and emotional demands are major considerations that need to be evaluated. Hence, this questionnaire is based on an emotional needs set for experience design (Hassenzahl et al, 2013) and usability heuristics for interface design (Nielsen, 1995). There are five levels of satisfaction of each question, from one (opposing the expectation) to five (a perfect fit of expectation). Nevertheless, this questionnaire is text-based, such as strongly disagree and strongly agree to represent fit anticipation or not. Participants of the evaluation choose the level that suited their anticipation and stated their opinions.

Here are some general feedbacks that could be significant for future concept development.

- I like the language, clear and not too much playful feeling
- Should have the possibility to see other user groups
- Working diary should be shared directly from the diary itself
- I should have the freedom to choose the receiver for info exchange
- It's very troublesome to share my information with the info exchange function
- Some terms make me very confused, and I don't know if I selected the thing that I wanted
- I felt somehow lost in the middle of exploring loop's features
- The introduction of loop is good
- Visualization based concept is perfectly better than the apps we have in the company at the moment
- The layout design is good and clear, but need information for further interaction
- Phone size is too small to read information

As mentioned above, the questionnaire emphasized on collecting emotional demands and the usability heuristics of the evaluation. The questions are generated from the definitions of emotional needs for experience design (Hassenzahl et al., 2013) and usability heuristics (Nielsen, 1995). Through referring these definitions and design concept of loop, the questionnaire was established. The results of generating four questionnaires can be seen in the following figure (figure 4-10). In Chapter Three, three major emotional demands that loop should satisfy were defined: autonomy, competence and stimulation. Evaluation results show that loop mostly satisfies these three emotional demands, as well as the other three demands (security, relatedness and popularity) neutrally. Moreover, the heuristics evaluation results show that users feel loop follows these user interface (hereafter referred to UI) design guidelines, and receives positive feedback after use.

Through reviewing expert evaluation results, these conclusions could support the concept to utilize analysis results as the basis of design concept development. These analysis results, such as the experience journey map, emotional demands set and experience pattern, could make tools more efficient and help designers to create design implications to fit users' anticipations and create interactive products that could produce fruitful user experiences.

Evaluation items	Strongly disagree	Disagree	Neither nor	Partly agree	Strongly agree
Autonomy				●	
Security			●		
Relatedness			●		
Competence				●	
Stimulation				●	
Popularity				●	
Personality of loop, humor and funny					●
Match between system and the real world			●		
Visibility of system status				●	
Consistency and standards			●		
Recognition rather than recall				●	
Flexibility and efficiency of use			●		

Figure 4-10:
Results of evaluation

4.7 Hi-Fi Visualizations

Based on the wireframe and evaluation feedback of the Lo-Fi prototype, a Hi-Fi visual interface was designed. Hi-Fi visualization demonstrates the design of the actual interface, as well as simulating the interaction design as an actual app on mobile devices. This Hi-Fi visualization is built on evaluated wireframes and user feedback. The design time and process was much smoother compared to building a Hi-Fi visualization without a draft. loop is mainly designed for larger-sized mobile devices, such as tablets. According to the research in heuristic analysis, utilizing some practical features, such as blue print drawings with a small screen size, could cause poor usability. Moreover, users could have better visibility of information while working on improvement activities with tablet computers.

Within this Hi-Fi visualization, the pragmatist was selected as the design target group. During user research, most of the interviewees were categorized as pragmatists. Based on this reason, this demonstration was designed for this user group. Hence, the working diary and project library will be the major features of the demonstration. Through introduction of loop with images and short sentences, users could understand the functionality of the app in a very short time. After signing up with personal information, three screening question will assist users to define which experience group they belong to. This feature do not only give users an overview of the possibilities of their working style and habits, but also give them references from other loop users.

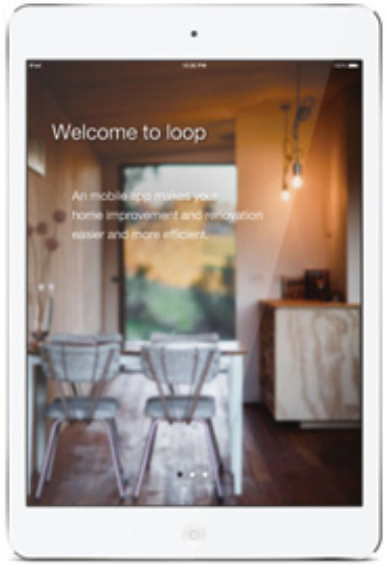


Figure 4-11:
Introduction page of loop

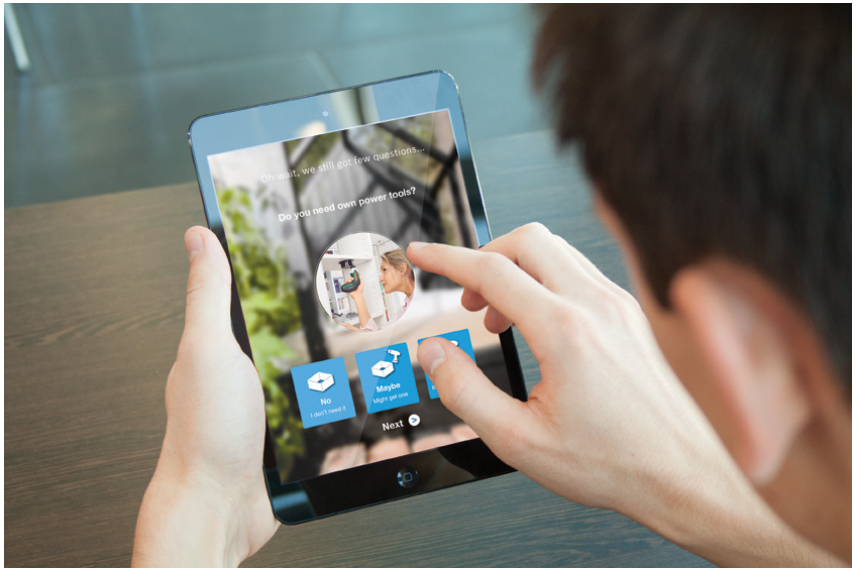


Figure 4-12:
User is answering screening question

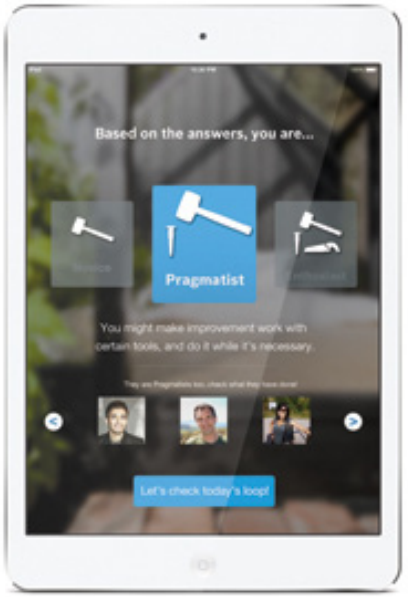


Figure 4-13:
User group definition

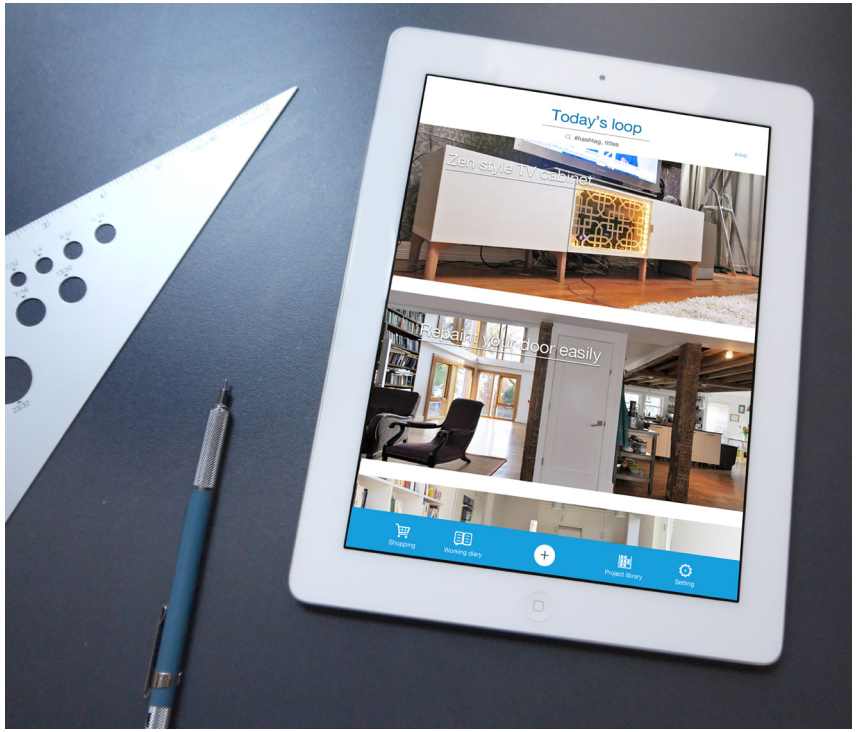
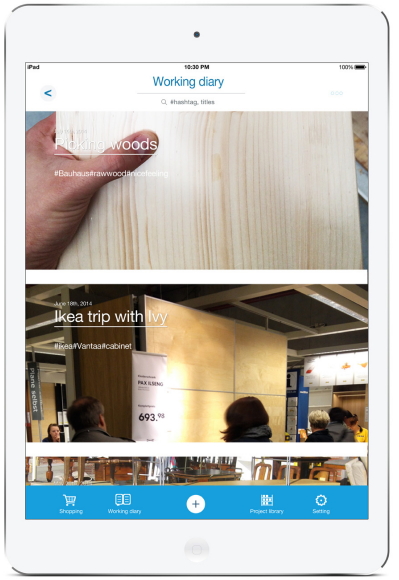


Figure 4-14:
Homepage of loop

After signing up and joining a user group, the user will be led to the homepage, which contains a default tool bar. In order to fit the different demands of all distinct user groups, the tool bar on the homepage of loop is customized as well. For instance, the default homepage for pragmatists contains shopping, a working diary and project library. These features are defining form value propositions found in Section 3.8. Documentation and reference are the most significant features for pragmatist users. Nevertheless, users can still adjust these features in the setting to adapt to their demands in the different stages of home improvement work.



A picture-based diary is easier for users to recall their memories and search for information.

Figure 4-15:
Working diary feature

Creating a new entry for the working diary within the same page reduces information layers. Users could insert information with convenience.

Figure 4-16:
Creating new entry of working diary

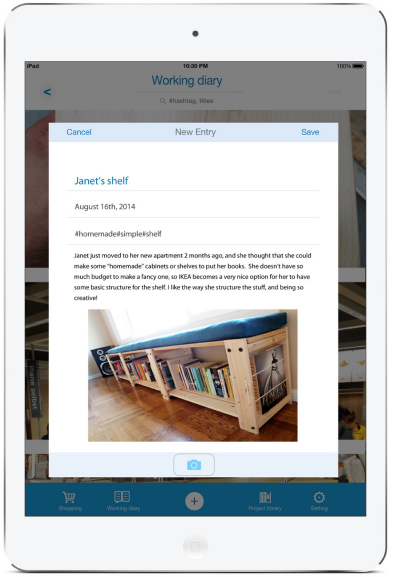
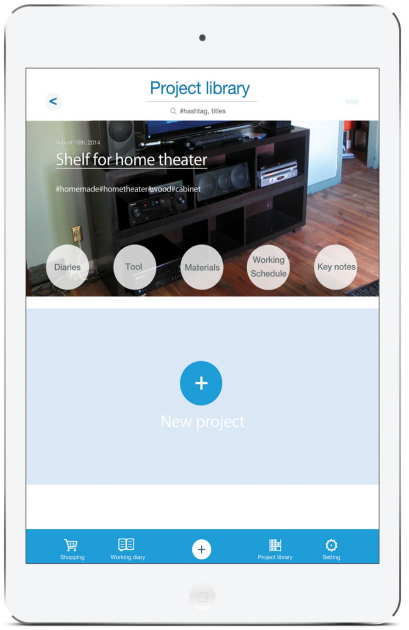


Figure 4-17:
Sharing information with devices near by

Sharing information is one of the major features of loop. Apart from sharing through social networks and emails, users can choose another way to interact with other loop users around or within a certain distance. Through bluetooth, users can simply tap the information and drag it to the other devices on which they would like to share the information. This method saves time from reading information from other applications, and the intuitive operation makes it more playful.

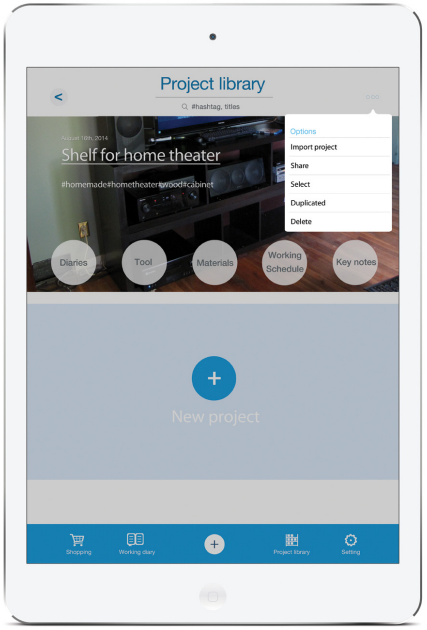


The project library assists users to organize their diaries for each project. In the library, users could easily track their working process and share with others.

Figure 4-18:
Project library feature

Without a side menu bar, loop reduces the complexity of interaction gestures. Most of the functions can be launched simply by clicking and a long press.

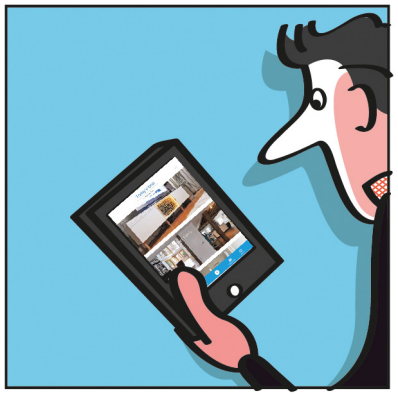
Figure 4-19:
Utilizing toolbar of project library



4.8 Scenario

Howard wants to make a new shelf for the new home theater set. He would like to make a shelf with his preferrable style and do it from scratch.

He is not very familiar with the working methods of building a shelf, and is tired of finding random information from the Internet. His friend suggests that he use loop to assist him on his project.

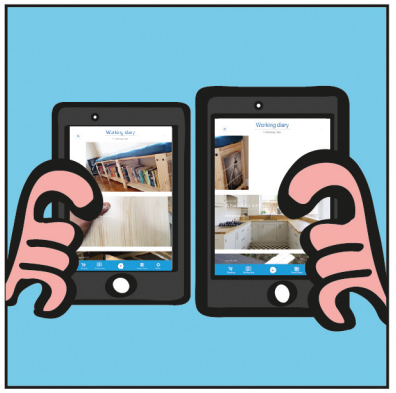


After signing up, Howard starts to check out the features of loop and search for inspiration from other people's projects.

He found several interesting projects and looked into the details of those examples. He marked those projects as references.

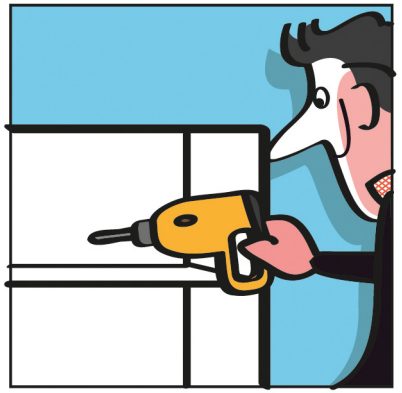
After collecting enough concepts and information from loop, he goes to a home improvement shop to purchase what he needs to build a shelf.

After the shop visit, Howard talks to his friend Mike, and they discuss the interesting findings that he got in the shop. Mike is also a loop user, and has already collected many materials and projects through loop.



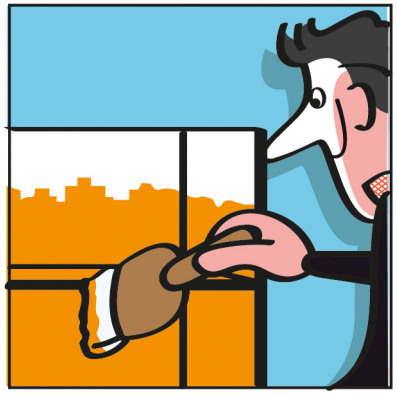
Mike shares an inspiring project with Howard through loop. By using the software, they could share information from one device to another directly.

Howard organized all the information, which includes tools, materials, working methods and schedules, through using loop. First of all, he rented a drill from a home improvement shop.

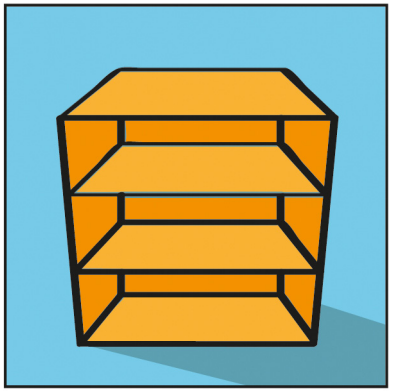


He referred the working methods that he gathered from loop, and started to assembly the shelf with his way.

loop also reminded Howard to paint the shelf in order to protect the surface of the shelf and the device.



Howard referred a painting guide he collected from loop.



A whole new homemade shelf is here!

Howard uses the working diary to record his achievement, and organizes all the information and details from the beginning till now to a complete project.

Now, he is satisfied with his new shelf and feels empowered after learning how to build his own work! He feels that loop is not just a kind tutor, but also helps him to learn home improvement from doing it himself.

5/5 Conclusion

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Painting, sculpture and architecture are finished, but the art habit continues.

- Robert Smithson, American land artist

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The main goal of this thesis work is to utilize various theoretical frameworks and methodologies to gain insight into user experiences and obtain a general overview of activities within diverse home improvement projects. As a side project, the mobile app “loop” was created based on the conclusions of the research and analysis. Home improvement is a part of our lives, and something we cannot live without. It appears as simple as trendy pictures in interior design magazines, and makes you think about beautiful and bright futures. However, it could also be extremely complex and confusing when one starts to do it. According to this phenomenon, many companies realize that applying innovative technologies to this “new” domain could be a good business. However, without knowing the holistic picture of user experiences and behavior patterns behind this extremely complicated domain, developing a product with powerful features that users would be able to utilize fruitfully could be an impossible mission for any company. Apart from the completed theoretical research and analysis, several major features of loop could also be seen to verify the theoretical hypotheses. These features were based on user experiences as well as users’ emotional and experiential demands. Through utilizing loop, users could have positive experiences when proceeding forward with home improvement activities. Although only a few features were developed in the concept development stage in the thesis work, an architectural diagram of the entire app was established, and it could be used as a reference for the collaboration company for further development of digital products in the home improvement domain.

Furthermore, the experience journey map, emotional needs map and pleasure-pressure diagram that was generated in the analysis phase could also be seen as significant contributions to the collaboration company regarding further research in any related topics in home improvement. These tools were generated through dissecting user studies and in-depth analyses with several frameworks. However, after categorizing the research findings with these theoretical frameworks, the conclusions were mostly text-based, and it was hard to clarify the significances and entire process to the stakeholders in the collaboration company.

Therefore, the texts were transformed into visualizations to provide an easier way to explain the entire story of research process, and to give examples to the stakeholders in the collaboration company using different expression methods to clarify the research conclusions.

Even significant findings of UX are defined within this thesis work, still, several important aspects are missing, especially interaction design between loop users and home environment. In chapter two, Smart Home and AmI are mentioned as possible technical practices to be integrated in assistance concept of home improvement activity. Within concept development section, the mobile app design demonstrates how visualization and interaction design could satisfy users’ emotional and practical demands. However, due to time limitation of working period, interaction design which integrates Smart Home and AmI to assist home imporvement activity does not have further discussion in this thesis. For collabortion company, this critical point could be a perfect chance to develop interaction design for future assisting concepts that distinguishing from competitors.

The Future Development of Thesis Work

In the future, this thesis work could be extended to include the following: developing a service design concept behind loop and long-term design strategy of home improvement related products. Within this thesis work, UX and IxD concepts have been defined for home improvement activities. However, these concepts have to be connected through a service wireframe in order to provide an effective product with systematic organization. As mentioned in previous chapters, home improvement is teamwork, and there are many stakeholders in this activity. To involve them efficiently without bringing chaos, multi-disciplinary design thinking has to be applied to loop’s further developments. In other words, loop should not only take into consideration how the interactive product itself could shape user experiences, but also combine other disciplines to create a competitive product package for users. This will be a significant task for further developments of any product in the household domain.

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Chapter 1

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Chapter2

Figure2-1: Harri Kiljader and Yi-Lin Setala

Figure2-2: https://nest.com/

Figure2-3: http://hightechtexan.com/wp-content/uploads/2014/05/wemo.jpg

Figure2-4: Hassenzahl M, Experience Design: Technology for All the Right Reasons, 2010, p.44

Figure2-5: http://www.research.philips.com/newscenter/pictures/downloads/systsoft_ambintel_16-0_h.jpg

Chapter3

Figure3-1~3-4: Tsui-Shan Tu

Figure3-5~3-9: Chien-Ting Jessie Hsu

Figure3-10: Hassenzahl M. et al., Designing Moments of Meaning and Pleasure. Experience Design and Happiness, 2013, p22

Figure3-11~3-21: Chien-Ting Jessie Hsu

Figure3-22: http://www.fugoolive.com/carpentry-tools-for-all-wish-i-had-them-as-a-kid/attachment/5051/#image-1

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Figure3-23: http://urbanyogabeirut.files.wordpress.com/2013/11/iain_mallory_067711.jpg

http://static.trustedreviews.com/94/000026546/befb_orh616w616/Playmaker-by-Bang-Olufsen1.jpg

http://metropoliawebsitetalks.files.wordpress.com/2010/01/marcbergers.jpg

Figure3-24: http://galleries.celebs.movies.2.pluz.in/albums/pictures/UK/fashion/shows/2011/Paris%20Fashion%20Week%20Spring%20Summer%202012%20Ready%20To%20Wear%20-%20Manish%20Arora%20-%20Catwalk/Paris%20Fashion%20Week%20Spring%20Summer%202012%20Ready%20To%20Wear%20-%20Manish%20Arora%20-%20Catwalk-f2a6a0391b9f24c50eefc67bb7f69142.jpg

http://2.bp.blogspot.com/-N1wc3pXRcTc/UK1mlW9I6NI/AAAAAAAAAAo/OJA1wg9yANw/s1600/cocktail-party.jpg

Figure3-25~3-31: Chien-Ting Jessie Hsu

Figure3-32: Yun Xi and Chien-Ting Jessie Hsu

Figure3-33: Chien-Ting Jessie Hsu

Figure3-34~3-39: Home Styler (Autodesk, http://www.homestyler.com/)

Magic Plan (Sensopia, http://www.sensopia.com/english/index.html)

Figure3-40~3-41: Chien-Ting Jessie Hsu

Chapter4

Figure 4-1~4-10: Chien-Ting Jessie Hsu

Figure 4-11~4-19 UI Design: Chien-Ting Jessie Hsu

Picture credit:

Figure 4-11: http://www.adventure-journal.com/wp-content/uploads/2014/04/adventure-journal-weekend-cabin-pump-house-australia-10.jpg

http://www.bosch-presse.de/presseforum/show/thumbnail/1-PT-14400.jpg

Figure 4-12: http://sickline.files.wordpress.com/2012/03/garden-shed-by-ville-hara-and-linda-bergroth1.jpg

Figure 4-13: Karan Shan, Vincent Spallek, Patti Wang

Figure4-14: http://static.dezeen.com/uploads/2014/09/Polycarbonate_house_in_Cambridge_by_Manfredo_di_Robilant_dezeen_784_17.jpg

http://www.ikeahackers.net/wp-content/uploads/2014/03/IMG_32291.jpg

http://static.dezeen.com/uploads/2014/09/Dorset_Road_by_Sam_Tisdall_Architects_dezeen_784_0.jpg

Figure 4-15: http://2.bp.blogspot.com/-77WmeN6-gbc/TnVUto2YNiI/AAAAAAAAWeg/xabYxlmjS68/s1600/ShelfIkea.jpg

Figure 4-16: http://www.instructables.com/files/deriv/FAG/J6DB/G1KD060K/FAGJ6DBG1KD060K.MEDIUM.jpg

Figure 4-17: http://static.dezeen.com/uploads/2014/09/Dorset_Road_by_Sam_Tisdall_Architects_dezeen_468_6.jpg

Figure 4-18~4-19: http://www.w1xbs.com/wp-content/uploads/2012/11/entertainment_complete.jpg

Scenario: Yun Xi and Chien-Ting Jessie Hsu

Appendices

I. Interview guideline- People who Are Proceeding with Home Improvement Activities

Activity: Kitchen renovation

1.Please introduce yourself (such as: personal background/ housing situation/ preference of life style)

2.Before we start to talk about your project, can you briefly talk about your previous experience of home improvement activities?

3.The case you provided in online survey is doing kitchen renovation. You also mentioned that your husband did most of the work. What are your roles in this activity? Why do you share working load in this way? Do you think gender makes any difference to your individual role in this activity?

4.When you proceed with this home improvement activity, will your son become most important consideration of your activity?

5.Did you make any working schedule for this activity before starting? What is estimated time frame of planning this activity? What dates are fixed for the renovation activity? Did you face any issue about time planning?

6.During this renovation, it seems like you are doing “multi-task” work. Do you proceed with all these work at the same time? Or do you have a clear timeline and schedule to separate the work?

7.During process, you mentioned about misunderstanding of assembling instruction is the hardest parts. Did you figure out any other solution for those issues until now?

8.What is the most important consideration of making purchasing decision? Price?

9.You mentioned that you did online searching for information about home improvement activity. What was your experience about searching information online?

10.You mentioned that you instructor as companion during actual working phase. Can you tell me the reason?

12.What kind of event(s) makes the home improvement activities frustrating?

13.In your case, what kind of event(s) within the process makes the home improvement activity enjoyable?

14.If you had an assistant with you all the time (providing information), what kind of events could s/he assist you with? (crazy ideas, as summary of interview)

Activity: Painting a wall in the livingroom

1.Please introduce yourself (such as: personal background/ housing situation/ preference of life style)

2.Before we start to talk about your project, can you briefly talk about your previous experience of home improvement activities?

3.The case you provided in online survey is painting the wall. What are your roles in this activity? How do you share working load? Do you think gender makes any difference to your role in this activity?

4.Did you make any schedule for this work before starting? What is estimated time frame of this activity? Did you face any issue about time planning?

5.During process, you mentioned about choosing color is the hardest part. Besides getting sample from store, did you figure out any other solution for that issue until now?

6.You mentioned that online searching for painting didn't work because you don't know how will it look like in actual situation. If there is a digital solution can help you to simulate the actual situation (such as augmented reality), will you take it?

7.When you visit home improvement stores, how did you do color picking? Will price be the main reason to affect your decision?

8.You mentioned you need a group of friends to be assistants during painting, can you tell me the reason?

9.You mentioned there are no suitable options in the question of "During hands-on phase of home improvement activities". So, what information would be helpful for you regarding your example?

10.What kind of event(s) makes the home improvement activities frustrating?

11.In your case, what kind of event(s) within the process makes the home improvement activity enjoyable?

12.If you had an assistant with you all the time (providing information), what kind of events could s/he assist you with? (crazy ideas, as summary of interview)

Activity: Multi tasks in home improvement activity (Painting the wall/Waxing floor/ Kitchen renovation/ Lighting and decoration work)

1.Please introduce yourself (such as: personal background/ housing situation/ preference of life style)

2.Before we start to talk about your project, can you briefly talk about your previous experience of home improvement activities before?

3.The case you provided in online survey is a multi-task renovation project for your whole apartment. You mentioned that a "big renovation work" has been done couple years ago, then some other works is keep going on. Can you briefly tell me the timeline and most important events?

4.You mentioned that kitchen renovation was the hardest part within these renovation works, and status of wall makes you very frustrated. Can you please tell me why and some more details about your kitchen project? Did you buy tools? Or only materials for the renovation?

5.Have you done this activity with other people? What are your and your friends' roles in this activity? Why do you share working load in this way? Do you think gender makes any difference to your individual role in home improvement activity?

6.Did you make any working schedule for kitchen renovation before starting to work? What is rough time frame of planning this activity? Did you face any issue about time planning?

7.You mentioned that budget planning is important to you. Why?

8.You mentioned that you visited home improvement stores for searching information and suitable products. Where did you visit? What was your experience of visiting?

9.You mentioned that you need a group of friend and an instructor as companions during actual working phase. Can you tell me the reason?

10.What kind of event(s) makes the home improvement activities frustrating?

11.In your case, what kind of event(s) within the process makes the home improvement activity enjoyable?

12.If you had an assistant with you all the time (providing information), what kind of events could s/he assist you with? (crazy ideas, as summary of interview)

Activity: Multi tasks in home improvement activity (Bathroom and sauna renovation)

1.Please introduce yourself (such as: personal background/ housing situation/ preference of life style)

2.Before we start to talk about your project, can you briefly talk about your previous experience of home improvement activities before?

3.The case you provided in online survey for your own work is painting work and fixing windows and doorframes. But you also mentioned a big renovation project for whole house was happening. Did all these works happen at the same time? Can you briefly tell me the timeline of these works?

4.Have you done this activity together? What are your roles in these activities? Why do you share working load in this way? Do you think gender makes any difference to your individual role in this activity?

5.Within your home improvement project, you also need to negotiate and consult with professional people. What was your experience? Was there any frustrating moemt?

6.You mentioned that time management was the hardest part within your renovation project. Did you make any working schedule before starting to paint? What is rough time frame of planning this activity?

7.What is the most important consideration of making purchasing decision of materials and products? For example, price.

8.You mentioned that you visited home improvement stores for searching information and suitable products. Where did you visit? What was your experience of visiting?

9.You mentioned that you need a group of friend and an instructor as companions during actual working phase. Can you tell me the reason?

10.What kind of event(s) makes the home improvement activities frustrating?

11.In your case, what kind of event(s) within the process makes the home improvement activity enjoyable?

12.If you had an assistant with you all the time (providing information), what kind of events could s/he assist you with? (crazy ideas, as summary of interview)

II. Interview guideline- Interior Designers

1.Please introduce yourself (such as: personal background/ What project are you working on/ preference of life style)

2.Have you done any home improvement activity for yourself?

3.Since you are interior designers, have you done any home renovation project? Or only newly built house's interior design? Do you think is there any difference between designing interior for a new house and proceeding with renovation?

4.Were there any friends who need professional suggestions from you? What are those questions from your friends?

5.You both have interior design education in Finland, is it possible for you to think any comparison of interior design concept between your home culture and Finland?

6.Time planning could be a very crucial part of interior design project. What is the major issue to affect planning schedule?

7.You both mentioned about knowing places to purchase materials and products are very important. Besides searching online, how do you get store information?

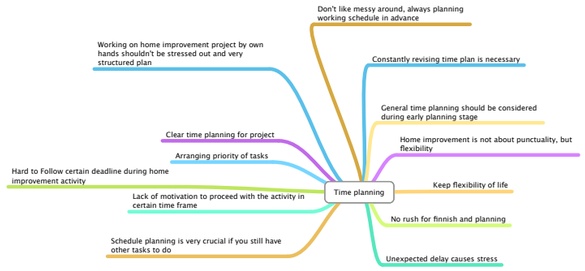
8.I think both of you have good understanding about materials and products. Besides price consideration, what is the main variable to choose ideal material or products? Do you usually need to go to store to confirm materials? Or you only shopping online?

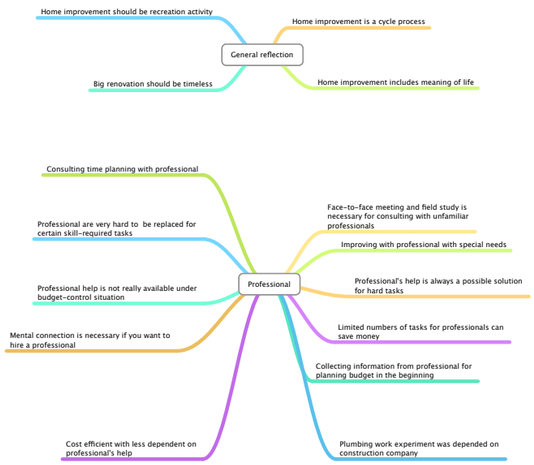
9.You mentioned about lighting design quite often in your survey answers. Do you think lighting design is the most significant part of any interior design project?

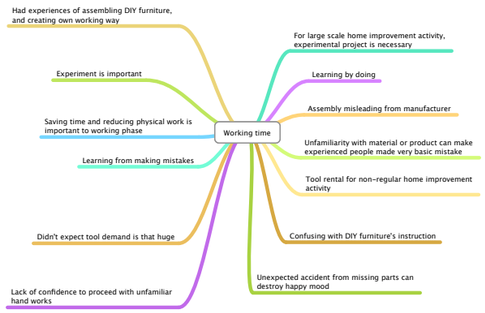
10.You both mentioned that you need an instructor as companion during actual working phase. Can you tell me the reason?

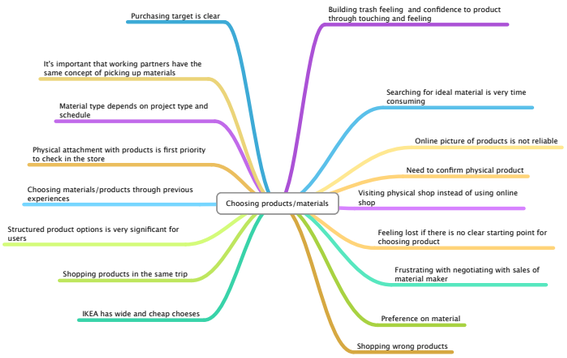
11.What kind of suggestions do you want to give to people who don't have many experiences on home improvement activities? Besides hiring someone professional in this domain.

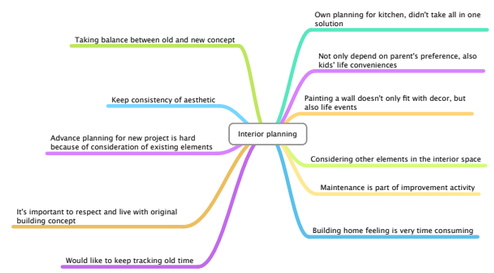
III. First round of Categorizing Insights from Interviews

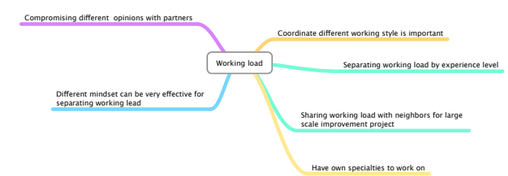


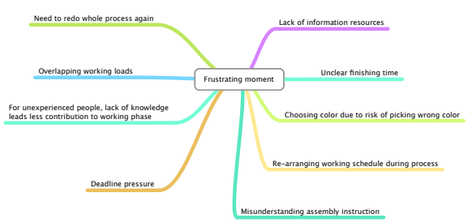


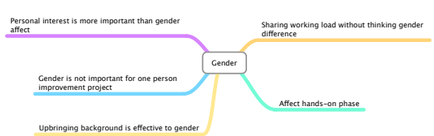


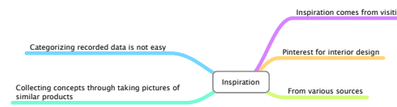


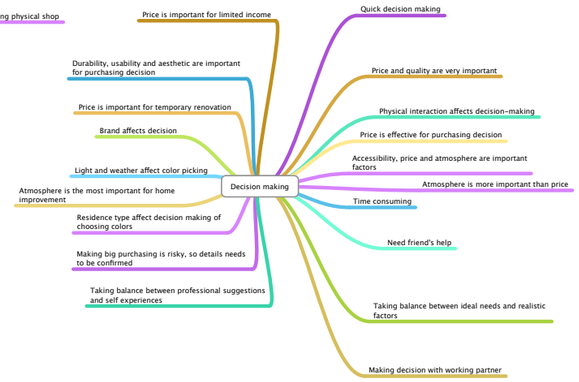


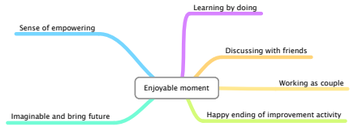


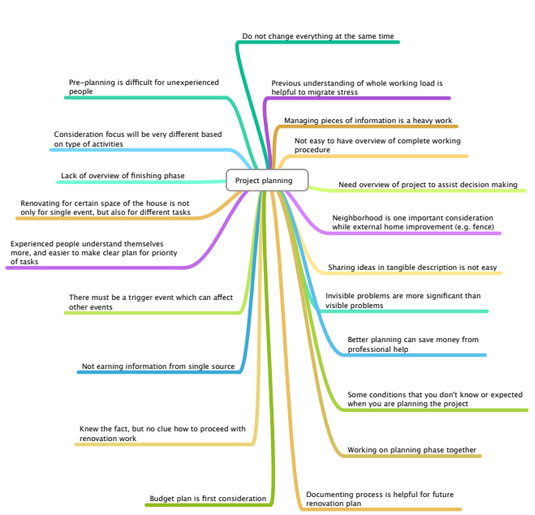


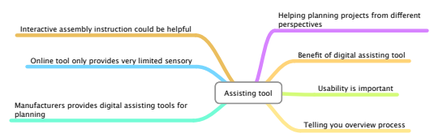


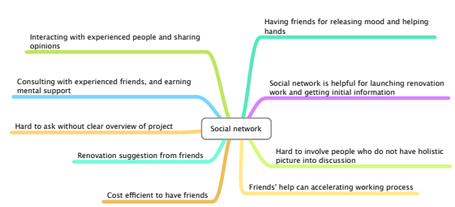




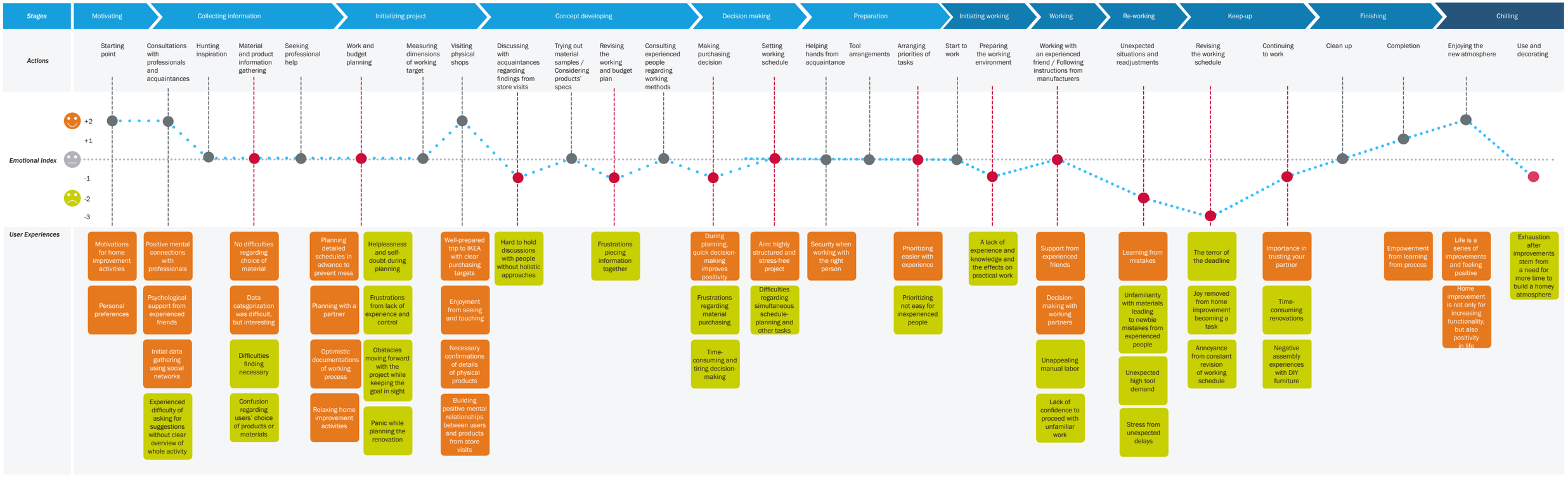


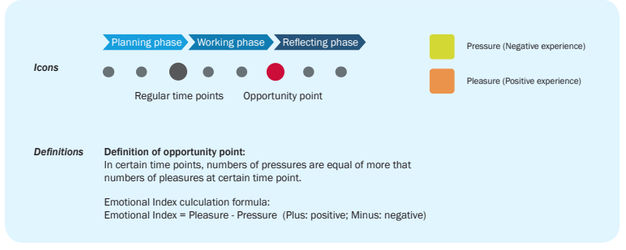






IV. Experience Pattern and Experience Journey Map





V. Emotional Demands Map

Planning phase

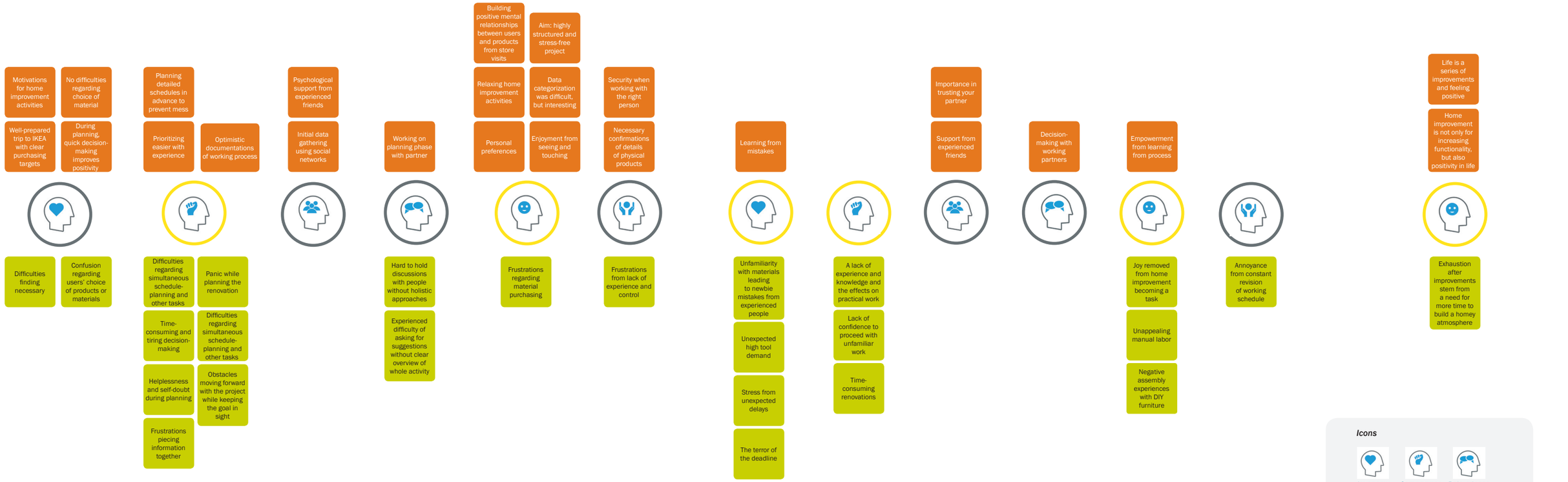
Key positive emotional demands: ***Stimulation***
Key negative emotional demands: ***Competence***

Working phase

Key positive emotional demands: ***Relatedness***
Key negative emotional demands: ***Autonomy, Competence and Stimulation***

Reflecting phase

Key positive emotional demands: ***Stimulation***
Key negative emotional demands: ***Stimulation***



VI. Questionnaire of Lo-Fi Prototype Evaluation

Questions	Strongly disagree	Disagree	Neither nor	Partly agree	Strongly agree
I can feel the freedom while using this product					
This is a reliable product					
I would like to involve my social networks while I'm using the product					
Through using this product, I could reach the goal much easier					
It is an innovative concept					
I would like to share my concepts with this product					
This product provides exciting feeling while using it					
It's boring to use this product					
It has proper humor, and I really enjoy use it					
This product speaks the language I understand					
I know what's going on while using the product					
I don't feel lost while browsing between different categories					
This product helps me to minimize memory load					
Layout of the interface is clear and easy to understand					

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